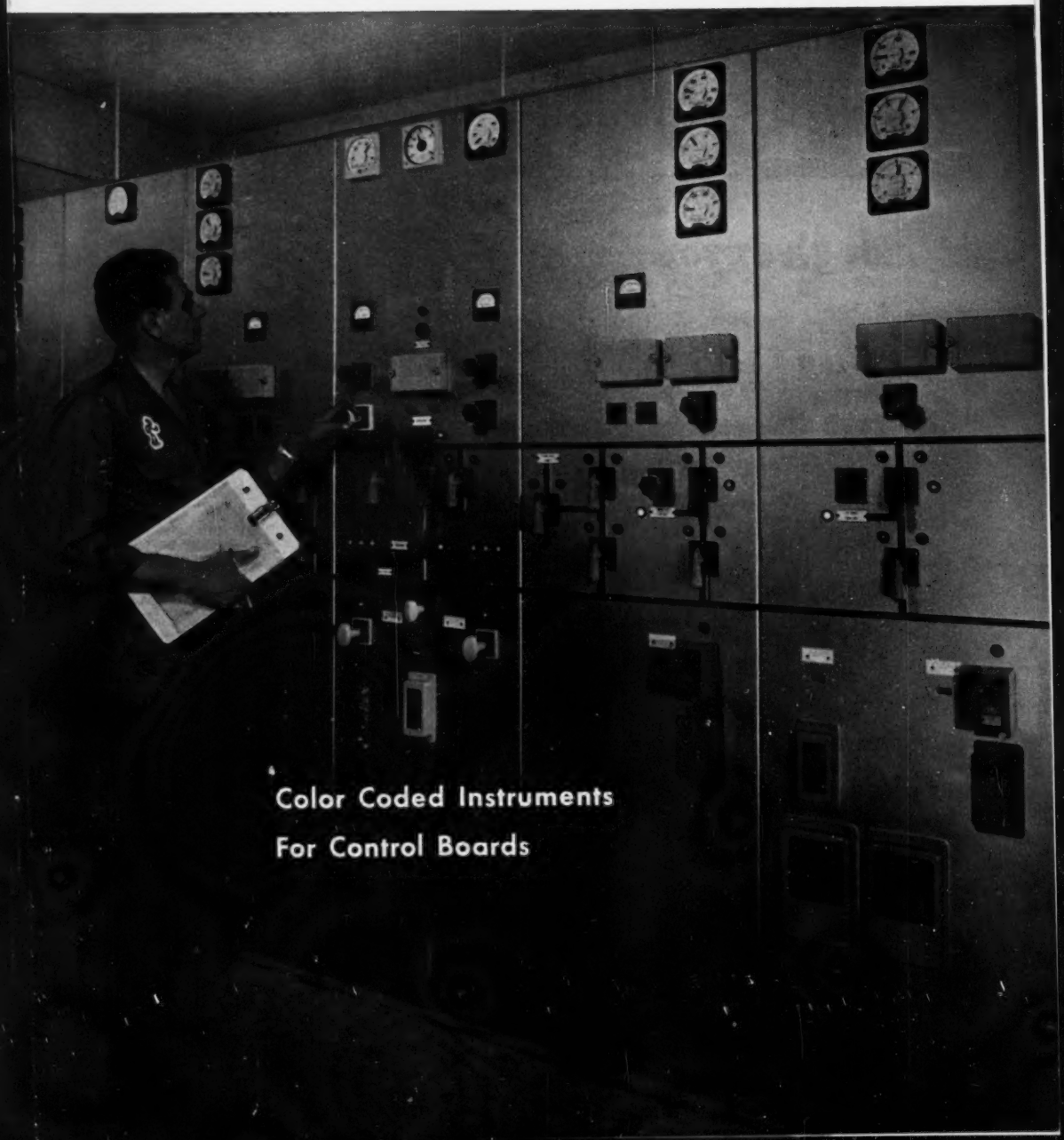
SEPTEMBER 24, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



Color Coded Instruments
For Control Boards

100 AMP. CIRCUIT BREAKER PROTECTION AT FUSE BOX PRICES

Another new Murray product

that gives you

Fully Magnetic! protection

LOW PRICE!

In the Murray 100 Amp. Service Control you get circuit breaker protection priced as low as comparable fused equipment.

MANY ADVANTAGES!

1. Fully magnetic circuit protection.
2. Carries full load regardless of temperature.
3. Plenty of room for easy wiring.
4. Compact (12-1/16 x 6-13/16 x 3-7/8—Indoor, surface type).
5. Easy to gang (No side handles).
6. Flush or surface mounting.

WHAT IS IT?

Service control equipment—3 wire, single phase, 120-240 Volts AC. Available in two types: 1—Indoor (surface or flush) or 2—Outdoor (raintight). Supplied with handle extensions for simultaneous manual tripping of two single pole independent trip fully magnetic circuit breakers in 70, 90, or 100 amps.

HOW IS IT USED?

1. Same application as a 100 amp. 3 wire fused switch with neutral or a 100 amp. 2 wire fused switch without neutral.
2. As Service Entrance Equipment.
3. As a main disconnect.
4. For protecting single phase lighting and appliance circuits or for fractional horse-power motor circuits.

IS IT AVAILABLE?

Yes! Call your distributor or contact your nearest Murray representative. Catalog numbers: Indoor—LV211A (Add S or F to indicate surface or flush mounting). Outdoor—LR211C (At slightly higher list price).

Murray®

FOR DETAILED INFORMATION, WRITE:

MURRAY MANUFACTURING CORPORATION

1250 Atlantic Avenue • Brooklyn 16, New York

Service Entrance & Meter Equipment · Magnetic Circuit Breakers · Switches
Current Limiting Reactors · Crows'nest Aerial Ladders

FOUR COLORS

The picture above, of the control room in Pennsylvania Power & Light's Engleside substation, looks a lot more glamorous to Electrical World editors as it appears on the cover of this issue. It is the first Electrical World cover to be printed in four colors.

The picture illustrates an important article on color-coded switchboards, and for this purpose we just couldn't print it in black and white. It would have been about as useful as a one-colored checkerboard.

Color for Speed

Both the number and complexity of switchboard instruments have grown as the industry has learned to centralize controls; in fact they've grown to such an extent that swift and accurate locating and reading of the right instrument at the right instant has become a difficult problem.

Instrument cases in color to fit a standard color code is the newest technique for making control room operation faster and more accurate.

Four Principles

Chief sponsor of the idea is Walter B. Morton of Pennsylvania Power & Light, who has made most of his color-coded switchboard studies during an extra-curricular job with the long-handled title of Chairman, Joint Subcommittee on Instrument Design, Pennsylvania Electric Association.

In this issue of Electrical World he sets down four basic principles for making instrument reading fast and accurate. The last and newest of these is "Scientific application of color in the color coding of instruments and devices."

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

Vol. 136 No. 13 — September 24, 1951

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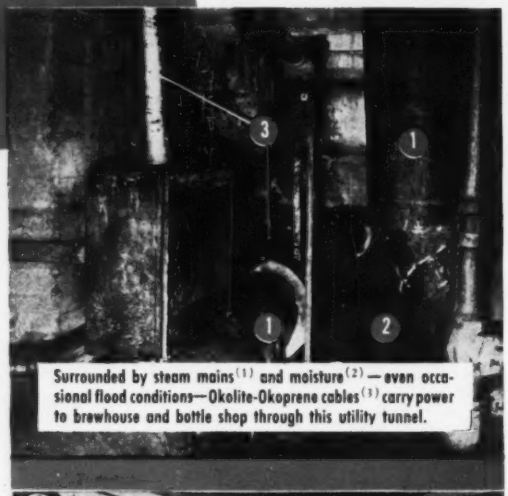
Stand up against

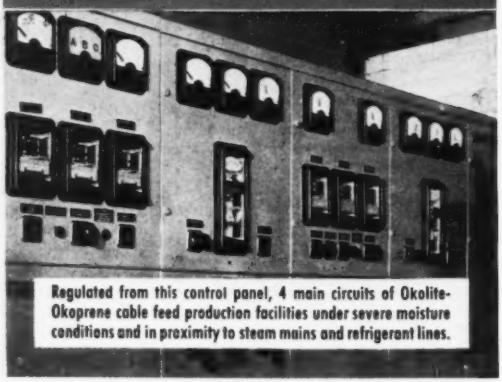
HEAT, MOISTURE and COLD

No braids to rot—resists moisture, ozone, sunlight, oil, chemicals, flame—simple construction—flexible and long-lived.

Bring Circuit Security to Falls City Brewery Company Louisville, Kentucky



Surrounded by steam mains (1) and moisture (2)—even occasional flood conditions—Okolite-Okoprene cables (3) carry power to brewhouse and bottle shop through this utility tunnel.



Regulated from this control panel, 4 main circuits of Okolite-Okoprene cable feed production facilities under severe moisture conditions and in proximity to steam mains and refrigerant lines.

Heat, moisture and refrigeration along the feeder circuits constantly threatened the power supply at the Falls City Brewery Company. A utility tunnel, carrying steam, gas and water in addition to the main power lend to the brewhouse and bottle shop, was the principal problem. Here, as in so many other process industries where power interruptions cannot be tolerated, OKOLITE-OKOPRENE cable was used.

Wherever rugged industrial operating conditions are found, electrical engineers specify service-proved OKOLITE-OKOPRENE cable. They take advantage of the Okonite program of constant research to provide longer-lived cables. They know Okonite's exclusive strip process ... how the insulation and the sheath are applied simultaneously and vulcanized *only once* in a metal mold, assuring perfectly centered conductors, a more stable and longer-lived insulation and sheath.

Industrial plants, railroads, mines and utilities insist upon OKOLITE-OKOPRENE cable for long-term dependability and economy ... management too, knows Okonite standards. For further information on OKOLITE-OKOPRENE cables, write for Bulletin EW-1053. The Okonite Company, Passaic, New Jersey.

OKONITE SINCE 1878 *insulated wires and cables*

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0150

Here is the world's most faulted power system!

This system begins and ends inside our High Power Laboratory. It owns only a few hundred feet of conductors, yet it has been faulted almost 250,000 times—deliberately!

It gets this purposeful punishment because it was erected specifically to serve *you* . . .

For into this miniature system of ours we connect every new interrupting device design. Here they are repeatedly subjected to all fault currents they might be expected to interrupt in actual service. And out of this testing comes the valuable data that enable us to prove . . . and to constantly improve . . . the equipment we build for you.

The testing of high-power circuit breakers provides a good example. The data gained from thousands of actual faults—proving ratings as high as 10,000,000 kva for 230,000 volts—have enabled us to reduce interrupting time, and the size of equipment to do the job. For *you* this means greater system stability and better service continuity. Most important, it means . . . you can always be *sure* when you specify Westinghouse.

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"De-ion®" Grid Interrupters
10,000,000-kva Interrupting Capacity
3 and 5 Cycle Interrupting Time
Reclosing Times as Low as 15 Cycles
Longer Contact Life
Smaller Tanks—Less Oil

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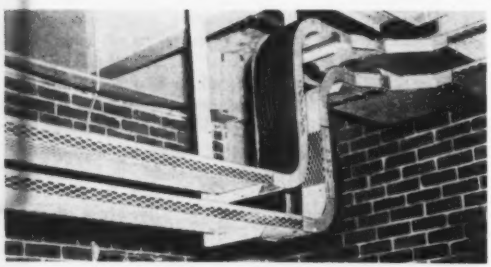
Westinghouse
CIRCUIT BREAKERS
WITH "DE-ION" GRIDS

In This
NATIONAL EMERGENCY

Save MATERIAL
Save MAN-HOURS
Save COSTS

with the new system of
COPE CABLE TROUGHS



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In addition, there is no better system on the market for the support of Cable and Instrument Tubing.

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If you have not already done so, write today for the new bulletin on Cope Cable Trough.

T.J. Cope INC.

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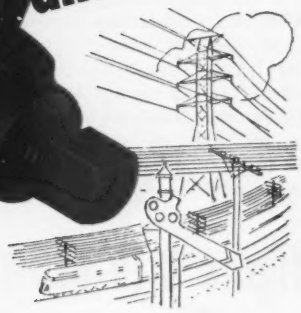
PHILADELPHIA 43, PENNSYLVANIA

For LOW-COST LIGHTNING PROTECTION that's PERMANENT use Copperweld® Ground Rods and Clamps

Struck 12 times during a single storm and 48 times in one year, the Empire State Building disproves the old saying that "lightning never strikes twice in the same place."

LOOK FOR THE NAME "COPPERWELD" — IT PROTECTS YOU!



YOU NEVER KNOW WHERE, WHEN, OR HOW OFTEN LIGHTNING WILL STRIKE . . . but you can secure safe, permanent and economical grounding protection when you install Copperweld* Ground Rods and Clamps. For every grounding application requiring the use of driven electrodes, these superior ground rods offer you these important advantages:

1. *Molten-Weld*—Permanent interlocking weld between the copper and alloy steel eliminates possibility of electrolytic action. No other ground rod has this inseparable union, accomplished only by the proved Copperweld Molten-Welding process.
2. *Ease of Installation* — Copperweld's extra-strong alloy steel core assures rigidity and easy driving even through very hard soils.
3. *High Conductivity*—Copperweld's thick sheath of pure copper provides excellent electrical conductance. Copper-to-copper contacts throughout insure low resistance.
4. *Protection Against Rust* — Copperweld's heavy copper armor permanently protects the alloy steel core against corrosion.
5. *Greater Economy* — Longer service life with no maintenance costs.

Start now to reduce outages and insure continuity of service by using Copperweld Ground Rods and Clamps. They provide safe, permanent, low-cost grounding protection at all types of locations—at poles, at towers, at power stations, at substations, at buildings — and for all grounding purposes.

COSTS YOU LESS — Copperweld — BECAUSE IT LASTS LONGER

MADE BY COPPERWELD STEEL COMPANY GLASSPORT, PA.

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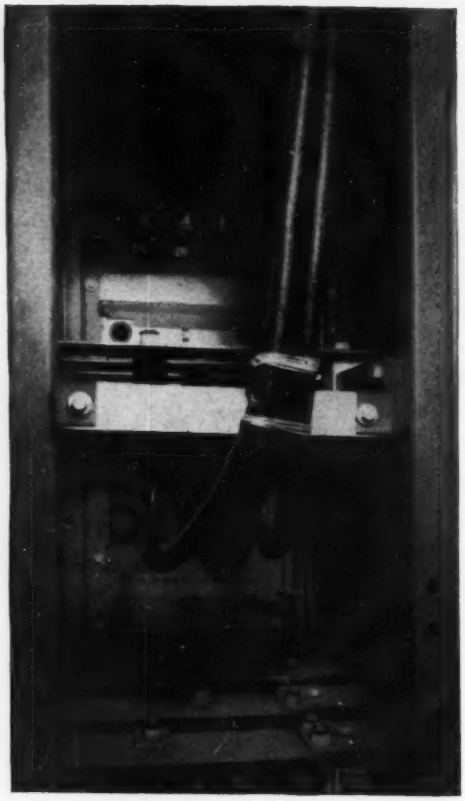
And All Their Distributors

A user REPORTS...

After their satisfactory experience with the 500,000 C. M. insulated aluminum cable (at right), National Supply Co., Torrance, Cal., says, "We will seriously consider aluminum when similar installations are planned." These cables, insulated with RH 600 v. U. S. Paracore, are connected to bus, from which they carry current to distribution panels for such heavy loads as welding machines, shears, rolls and other equipment.



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When you plan new production lines, add feeders for heavier loads, get prices both ways—in aluminum and in copper. You'll find you can make worth-while savings with aluminum . . . and installation is faster, easier because of aluminum's light weight.

Although the rearmament program restricts the use of aluminum, we are ready to help you with the planning for trouble-free, low-cost wiring.

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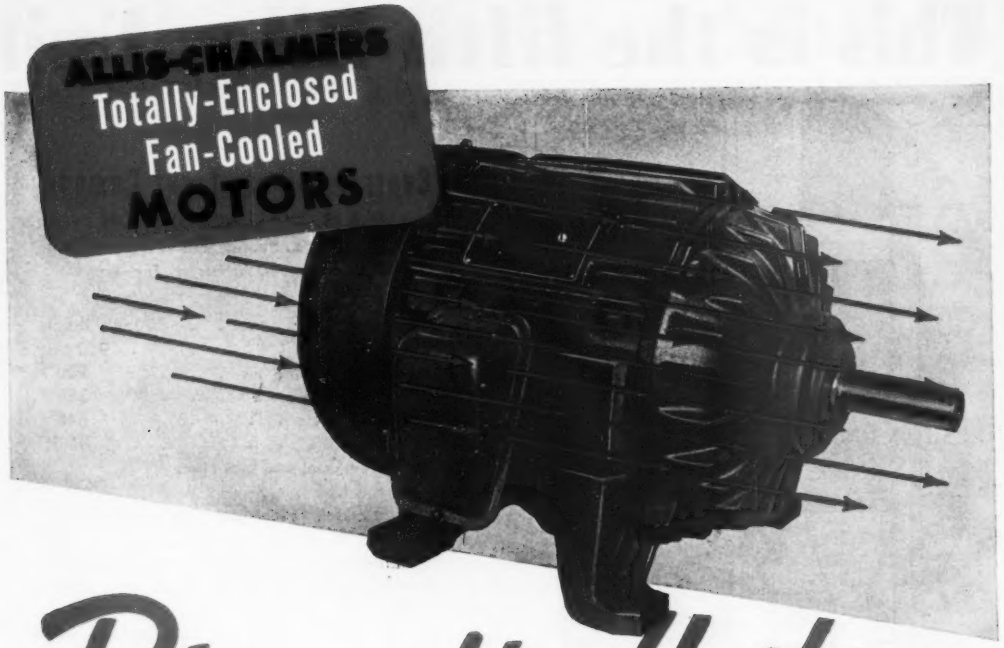
ALCOA

of ALCOA EC ALUMINUM are made by leading manufacturers



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3427

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Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

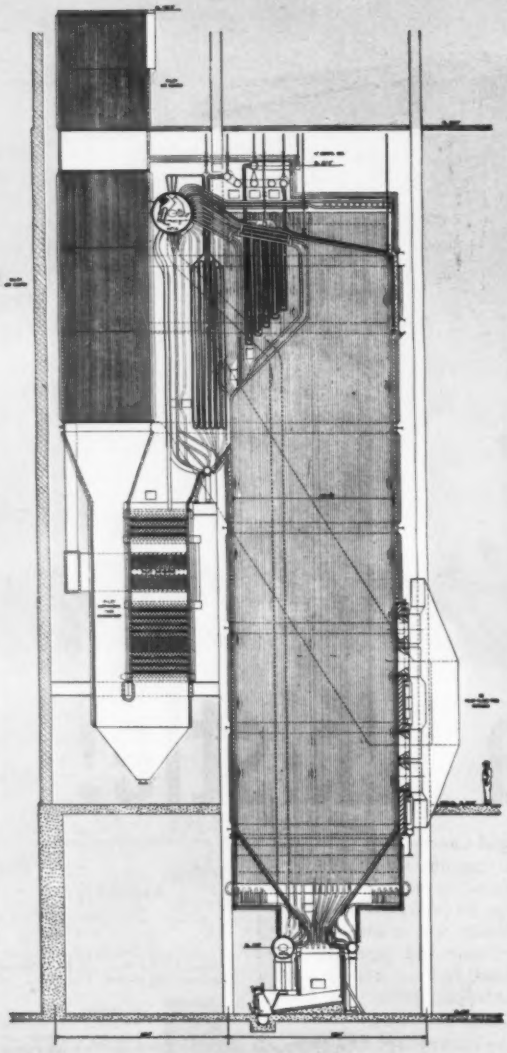
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

This is the fifth Riley Unit



Central Illinois Light Company

R. S. WALLACE STATION

E. Peoria, Illinois

Commonwealth Services Inc., Engineers

Capacity	600,000 lbs./hr.
Design Pressure	950 psig.
Steam Temperature	900°F.
Exit Gas Temperature	325°F.
Air Temperature	645°F.
Efficiency	86.5%
Pulverized Coal and Gas Fired	
Coal	
Central Illinois Strip Mine	
Moisture	20%
Volatile	31.2%
Fixed Carbon	34.4%
Ash	14.4%
B.T.U.	9000
Fusion Temperature	1900-2000°F.
Sulphur	3.2%
Heat Balance	
Dry Gas Loss	5.02%
Hydrogen and Moisture Loss	6.16%
Moisture in Air Loss	0.12%
Unburned Combustible Loss	0.40%
Radiation Loss	0.30%
Manufacturer's Leeway	1.50%
Total Losses	13.50%
Efficiency of Unit	86.5%

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RILEY

STOKER CORPORATION, WORCESTER, MASS.

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BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

for the R.S. Wallace Station

Central Illinois Light Company ordered their first Riley Steam Generating Unit in November 1936—a second unit in July 1939—two additional units in July 1945 and the latest unit, which is now being installed, a 600,000 lbs./hr. Riley unit, in November 1948. Making a total capacity of Riley units in the R. S. Wallace Station of 1,800,000 lbs./hr. All steam generating units purchased since 1936 for this station have been Riley units.

This is a typical case. Users of Riley equipment almost invariably order additional Riley units when expanding their facilities. Following is a partial list of public utility companies who have repeatedly ordered Riley units:

Public Service Company of Indiana	7 units
Iowa-Illinois Gas & Electric Co.	6 units
Interstate Power Company	7 units
South Carolina Gas & Electric Co.	3 units
Central Ohio Light & Power Co.	5 units
Houston Lighting & Power Co.	9 units
Gulf Power Company	3 units
Utah Power & Light Co.	4 units
Otter Tail Power Co.	7 units
Mississippi Power Co.	3 units

Users come back for more Riley units not only because of the reliability, economical operation and continuity of operation of Riley equipment, but also because of the manner in which Riley handles details during the various stages of the contract—engineering, production and erection—and because of the service co-operatively rendered after years of operation. Users have learned they can rely on Riley and that it pays to investigate Riley equipment before purchasing steam generating or fuel burning equipment. It will pay you to do so.

All of these public utilities have ordered Riley Steam Generating Equipment:

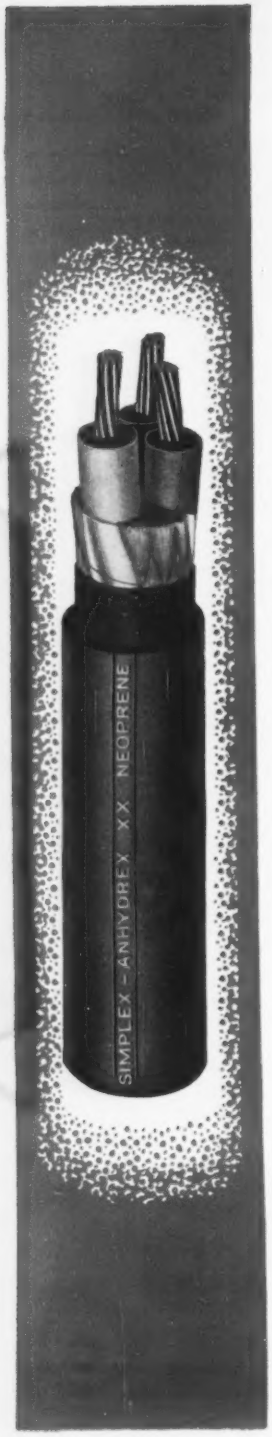
The Potomac Edison Co.	
Albright Station	1–700,000 lbs./hr.
Iowa Electric Light & Power Co.	
Boone Station	1–275,000 lbs./hr.
Northern States Power Co.	
Granite Falls Station	1–385,000 lbs./hr.
South Carolina Public Service Authority	
Moncks Corners Station	2–460,000 lbs./hr.
Monongahela Power Company	
Albright Station	1–700,000 lbs./hr.
Superior Water, Light & Power Co.	
Superior Station	1–125,000 lbs./hr.
Houston Lighting & Power Co.	
Gable Street Station	1–140,000 lbs./hr.
Gable Street Station	1–250,000 lbs./hr.
Gable Street Station	1–350,000 lbs./hr.
Greens Bayou Station	2–675,000 lbs./hr.
West Junction Station	2–400,000 lbs./hr.
West Junction Station	2–825,000 lbs./hr.
Public Service Co. of Indiana	
Dresser Station	1–300,000 lbs./hr.
Edwardsport Station	3–400,000 lbs./hr.
Noblesville Station	3–300,000 lbs./hr.
Northern Virginia Power Co.	
Riverton Station	1–350,000 lbs./hr.
Central Illinois Light Co.	
R. S. Wallace Station	1–600,000 lbs./hr.
R. S. Wallace Station	4–300,000 lbs./hr.
Arkansas Power & Light Co.	
Cecil Lynch Station	1–650,000 lbs./hr.
Utah Power & Light Co.	
Orem Station	1–450,000 lbs./hr.
Jordan Station	1–620,000 lbs./hr.
Jordan Station	1–575,000 lbs./hr.
Worcester County Electric Co.	
Webster Street Station	1–325,000 lbs./hr.
West Penn Power Co.	
Milesburg Station	2–210,000 lbs./hr.
Interstate Power Co.	
Dubuque Station	1–200,000 lbs./hr.
Lansing Station	2–120,000 lbs./hr.
Fox Lake Station	2–120,000 lbs./hr.
Clinton Station	1– 45,000 lbs./hr.
New Orleans Public Service Co.	
Market Street Station	1–330,000 lbs./hr.
Iowa-Illinois Gas & Electric Co.	
Riverside Station	3–250,000 lbs./hr.
Coralville Station	1– 60,000 lbs./hr.
Moline Station	2–200,000 lbs./hr.
City of Los Angeles	
Harbor Steam Station	3–825,000 lbs./hr.
Harbor Steam Station	2–675,000 lbs./hr.
Mississippi Power Co.	
Plant Eaton	3–230,000 lbs./hr.
Otter Tail Power Co.	
Kidder Station	2–100,000 lbs./hr.
Crookston Station	2– 75,000 lbs./hr.
Devils Lake Station	1– 75,000 lbs./hr.
Canby Station	1– 75,000 lbs./hr.
Ohio Edison Co.	
Mad River Station	1–250,000 lbs./hr.
South Carolina Power Co.	
Plant Hagood	2–230,000 lbs./hr.
Plant Hagood	1–900,000 lbs./hr.
Gulf Power Co.	
Pensacola Station	2–230,000 lbs./hr.
Pensacola Station	1–325,000 lbs./hr.
Union Electric Co. of Missouri	
Ashley Street Station	2–285,000 lbs./hr.
Ashley Street Station	3–310,000 lbs./hr.
Central Ohio Light & Power Co.	
Woodcock Station	2–120,000 lbs./hr.
Woodcock Station	1– 90,000 lbs./hr.
Woodcock Station	2– 60,000 lbs./hr.
Pennsylvania Electric Co.	
Williamsburg Station	1–300,000 lbs./hr.
Carolina Power & Light Co.	
Moncure Station	2–330,000 lbs./hr.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS



NOW

All Three in One High-Voltage Cable

- **MOISTURE RESISTANCE**
- **OZONE RESISTANCE**
- **RESISTANCE TO HEAT AND AGING**

For the first time these three important properties, moisture resistance, ozone resistance, and resistance to heat and aging, are combined in a single high-voltage insulation. Simplex-Anhydrex XX insulation has proved itself to be far and away your most dependable assurance of low cost, trouble-free cable operation at the higher voltages. Here's why:

Aged for 16 weeks at 250°F. (121°C.), Simplex-Anhydrex XX retained approximately 50% of its tensile strength, nearly 68% of its elongation. More than that, its rate of deterioration after the first few weeks was very slight, indicating exceptional stability and long life. It remained rubber-like in quality and appearance and was still suitable for further use. Compare this with ordinary vegetable oil base and heat-resistant compounds which, inside of only 3 weeks, became brittle, cracked and crumbled.

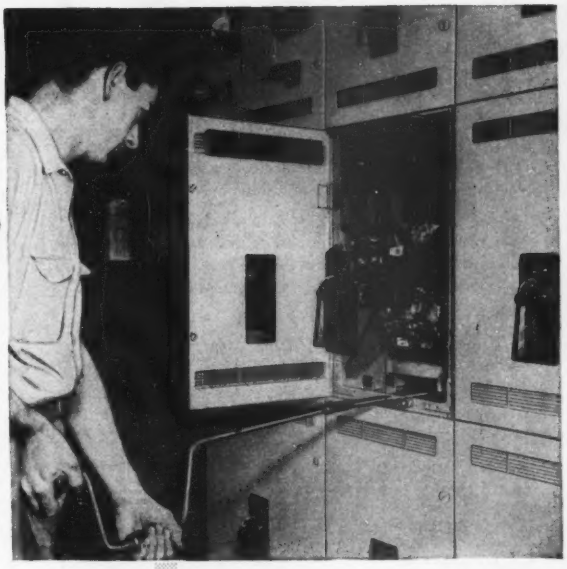
Aged for 7 days at 250°F. (121°C.), Anhydrex XX was then immersed for a week in distilled water at 158°F. (70°C.). It absorbed less than 15 mg. per square inch of exposed surface.

Aged for 7 days at 250°F. (121°C.), Simplex-Anhydrex XX was bent around a mandrel and exposed to .03% ozone for 4 hours yet would not crack.

Compare these values with those of any other high-voltage insulation. You'll find a big difference whenever Simplex-ANHYDREX XX Cables are on the job; a difference that pays off in more economical, more efficient, and more reliable power transmission. If you would like more complete information and specification data on Anhydrex XX insulation, simply drop us a line at the address below.

SIMPLEX WIRE AND CABLE COMPANY
79 Sidney Street, Cambridge 39, Massachusetts

WHY do modern plants use drawout switchgear?



The key to high production in modern plants is continuous electrical service. Drawout construction is the switchgear feature that assures service continuity by means of interchangeable circuit breakers. In general, drawout construction advantages are:

1 reduced labor costs

When loads change and it becomes necessary to change breaker ratings because of new circuit requirements, it can be done easily on a spare breaker which is then substituted in the switchboard.

2 less down time

When changing breakers for any reason, total outage time need not exceed several minutes. One spare breaker can provide adequate, economical insurance for 20 or more feeder circuits.

3 improved plant safety

Breakers can be withdrawn from the enclosure. The breakers and the associated circuits may readily be inspected, adjusted, and maintained—without danger to the operator.

Drawout construction is just one of the reasons for the superiority of I-T-E Low Voltage Switchgear. Like so many other features, drawout construction was popularized by I-T-E, where switchgear is a business, not a sideline.

For further information, write I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania. Subsidiaries: Railway and Industrial Engineering Company, Greensburg, Penna., and Eastern Power Devices, Ltd., Toronto.

The ITE Company

How To Select a Power

HOW DO YOU KNOW the transformer you select will give you most performance per dollar over the longest time?

Transformers are pretty well standardized in appearance, ratings and original specifications. Some people may even think they *are* the same. But based upon ability to stand up in service, it's amazing how transformers differ.

Just look at the corona-free design, for example.

In the corona-free transformer designers eliminated corona* at the maximum test levels. Transformers like these retain full impulse strength even after repeated lightning and switching surges. They stay young. They're built to last years longer and *do*.

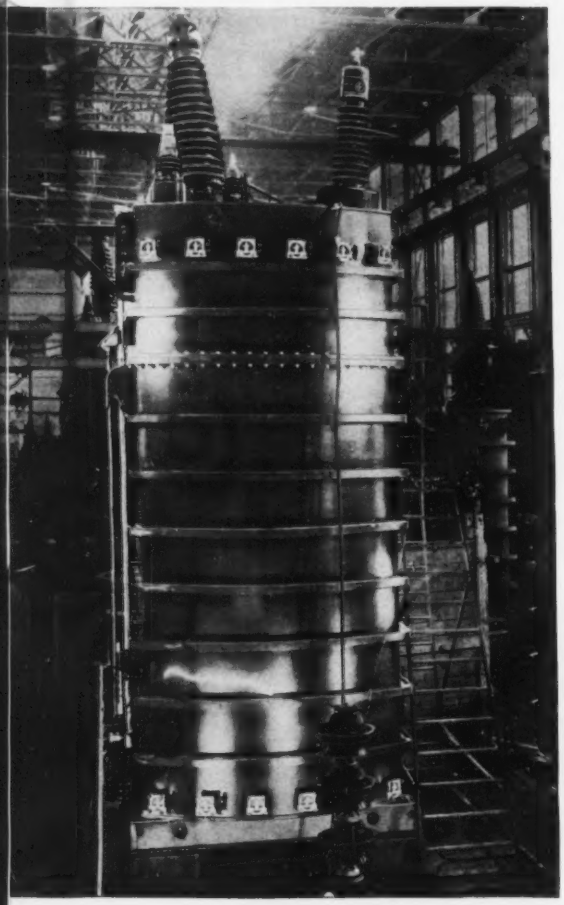
Corona-free design at Allis-Chalmers is the result of 19 years of research and testing — when lightning first became a recognized factor. Through use of calculating boards, powerful surge generators and oscillograms, engineers were able to detect the slightest trace of corona during impulse tests and take steps to eliminate it.

They put in close-fitting insulation around coils and conductors, eliminated voids, diffused dielectric flux so that each part of the winding was corona-free at maximum test conditions.

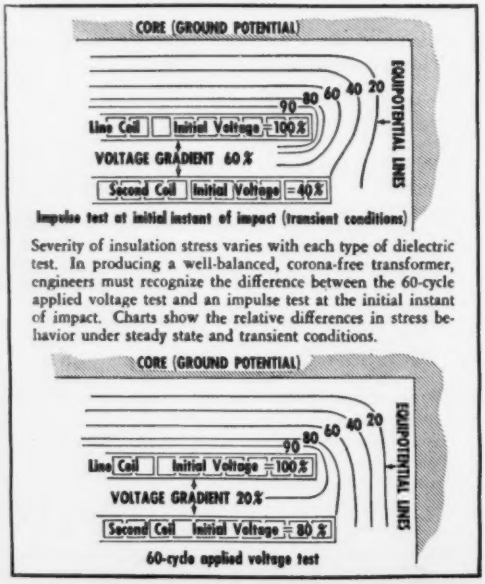
Failure-free operation of these power transformers means long lasting performance . . . more performance for each dollar invested. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3489

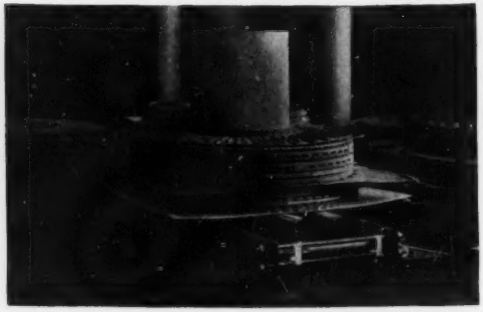
*Corona is a dielectric discharge that scores insulation and destroys impulse strength.



An AIEE chopped wave test at 1,035,000 volts for this 35,000 kva autotransformer is one of its last performance checks before shipment. New equipment and streamlined testing procedures have cut testing time from weeks to hours.

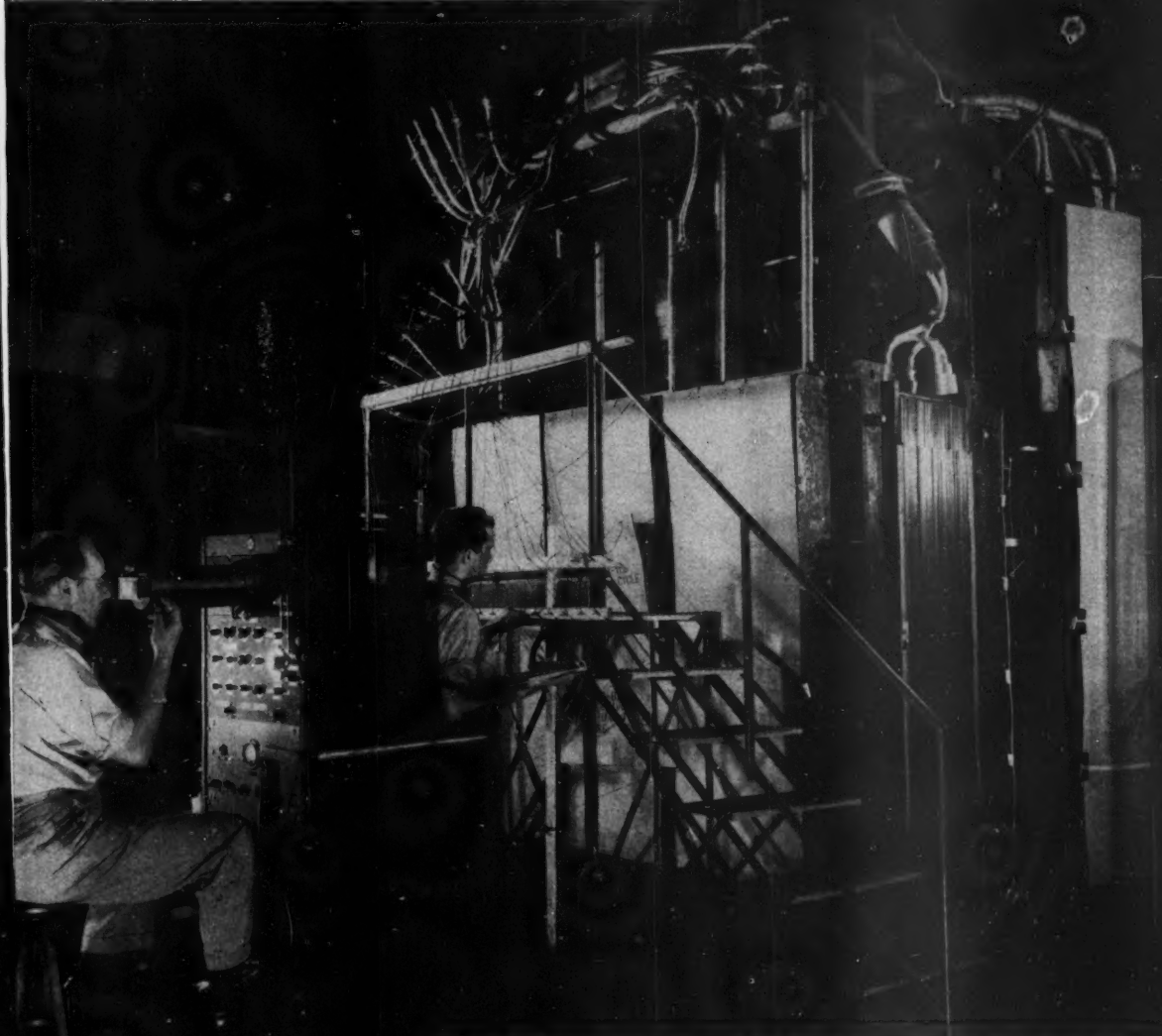


Severity of insulation stress varies with each type of dielectric test. In producing a well-balanced, corona-free transformer, engineers must recognize the difference between the 60-cycle applied voltage test and an impulse test at the initial instant of impact. Charts show the relative differences in stress behavior under steady state and transient conditions.



Form-fitted insulation you see on this 30,000 kva forced oil-cooled transformer will reduce the effects of concentrated dielectric fields. By placing insulation next to areas of dielectric stress and by rounding insulation surfaces, dielectric stress is reduced.

Transformer



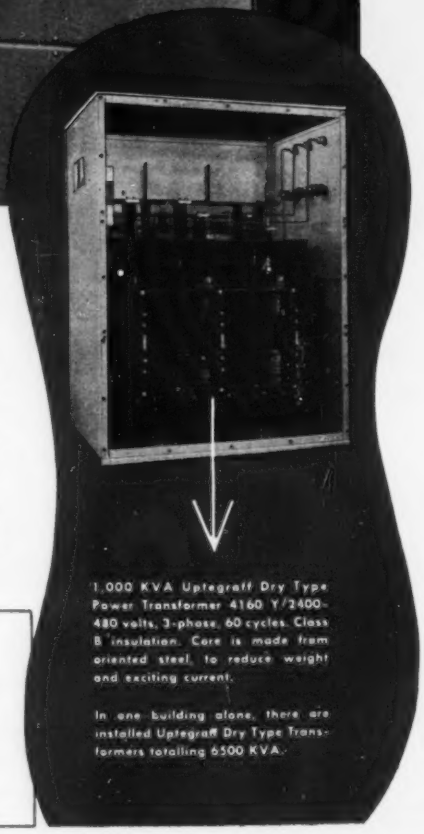
ALLIS-CHALMERS

This 50,000/66,667 kva transformer for a Texas utility is getting a voltage distribution test before its final full-voltage impulse test. Such a design check tells whether the assembled transformer will react properly under maximum impulse voltage stresses.

With noise level well under N.E.M.A. standards, this Uptegraff Dry Type Power Transformer is ideal for hospitals, commercial buildings, institutions, central station auxiliary service and other installations where quiet operation, as well as economy, efficiency and dependability are desired. As shown in the photograph above, a noise-meter check is part of the regular factory-testing procedure to which these Uptegraff Transformers are submitted before shipment.

Other features are: electrical and mechanical ruggedness; light weight; high efficiency; safety and dependability. Class B insulation is used for these units.

The Uptegraff production system permits us to build and ship Power, Distribution and other types of transformers in all commercial sizes and ratings with minimum delay. Your inquiries are invited.

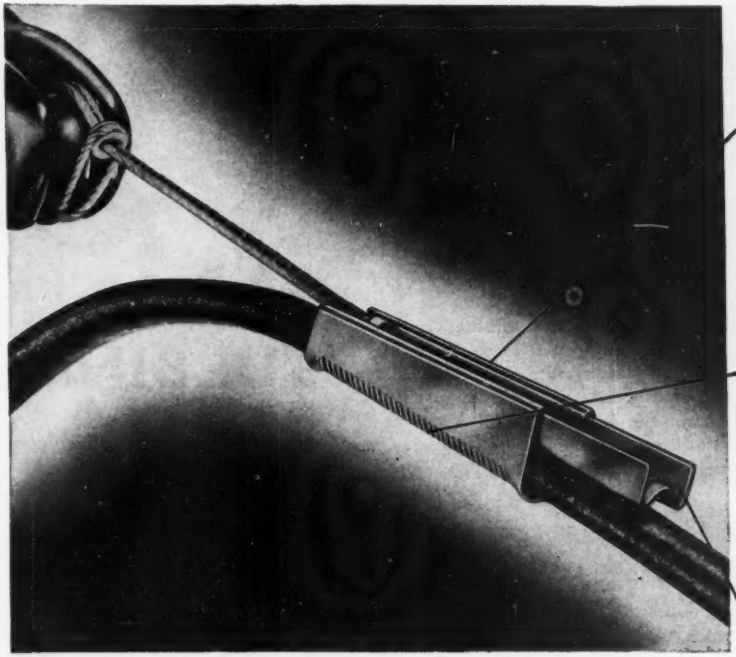


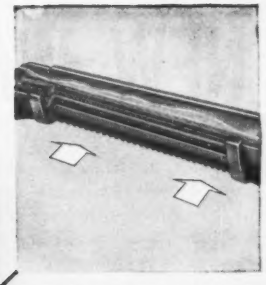
1,000 KVA Uptegraff Dry Type Power Transformer 4160 Y/2400-480 volts, 3-phase, 60 cycles. Class B insulation. Core is made from oriented steel, to reduce weight and exciting current.

In one building alone, there are installed Uptegraff Dry Type Transformers totalling 6500 KVA.

R. E. UPTEGRAFF
MANUFACTURING COMPANY
SCOTTDALE, PENNSYLVANIA
Makers of: POWER, DISTRIBUTION,
INSTRUMENT and SPECIALTY TRANSFORMERS

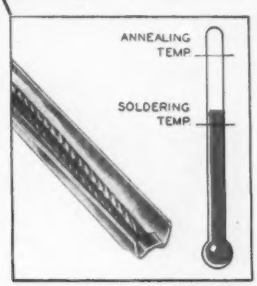
Accents on Accuracy





1. Rails of wedges and shells are held closely parallel to assure that application of pressure to cable is evenly distributed.

2. Rails of wedges and shells are formed to provide a minimum of friction between cooperating surfaces, to assure proper tightening under load.



3. Bails are soldered to wedges without annealing, to retain maximum strength of joint.

in the manufacture of

CONCENTRIC CABLE CLAMPS

The area of the clamping surfaces designed into Reliable Concentric Cable Clamps prevents snubbing of the cable over a small radius with its consequent opening of the braid and also minimizes wear. Tightening automatically under load it retains its grip even if the cable shrinks. Cable does not have to be threaded through the clamp. It is possible to put up and sag the cable before cutting. Reliable Concentric Cable Clamps are available with flexible or solid bails.

POWER-LINE CONNECTORS
AND
CONSTRUCTION SPECIALTIES

Reliable **ELECTRIC COMPANY**

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

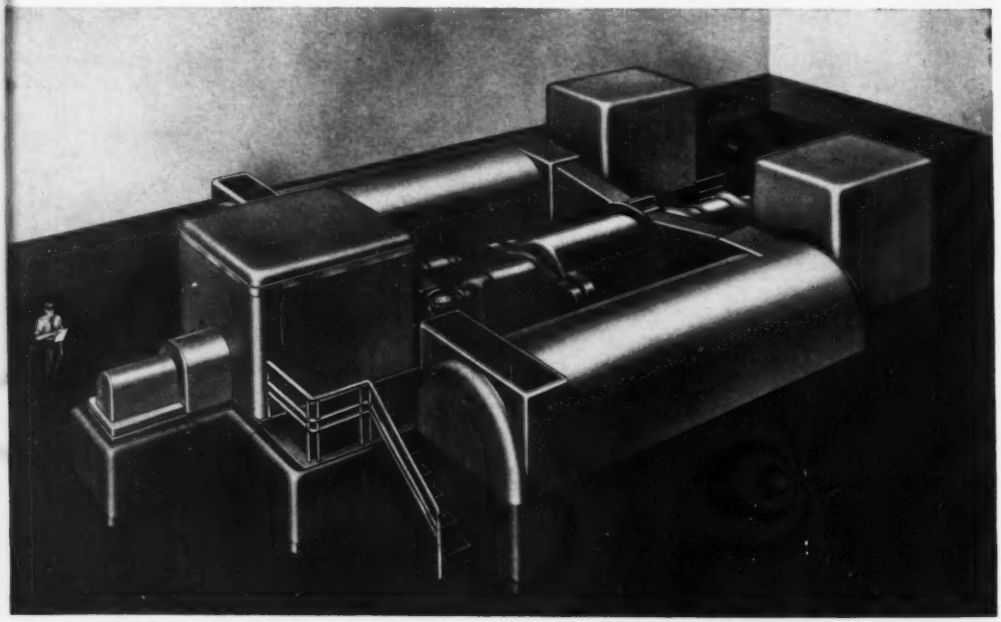
NEW WAY TO HANDLE DEMAND

Power companies, compelled to meet sudden new load demands from defense industries in outlying territories, may find the answer to their problem in the simplicity of General Electric gas turbines. Gas turbines, though they stand on their own feet as far as economy of power generation is concerned, also offer unique advantages for service in end-of-the-line plants.

For example, a gas turbine is easily and quickly installed. There's no massive foundation to worry about, and the building which houses the unit can be of the simplest construction. Furthermore, a gas turbine-generator is easy to operate—it offers the excellent possibility of modification for remote operation in the future. If load demands change, the design of the gas turbine makes moving to a new location a practical, inexpensive operation.

Several utilities, recognizing these distinctive gas turbine advantages, have ordered units to firm up service in outlying territories. If you have a similar problem, why not investigate this possibility yourself? A General Electric turbine specialist in your nearby sales office will discuss the application in the light of your requirement. And, if you'd like a copy of our 28-page bulletin describing gas turbines, write to General Electric Company, Schenectady 5, N. Y., for GEA-5516, "Gas Turbine Power Plants."

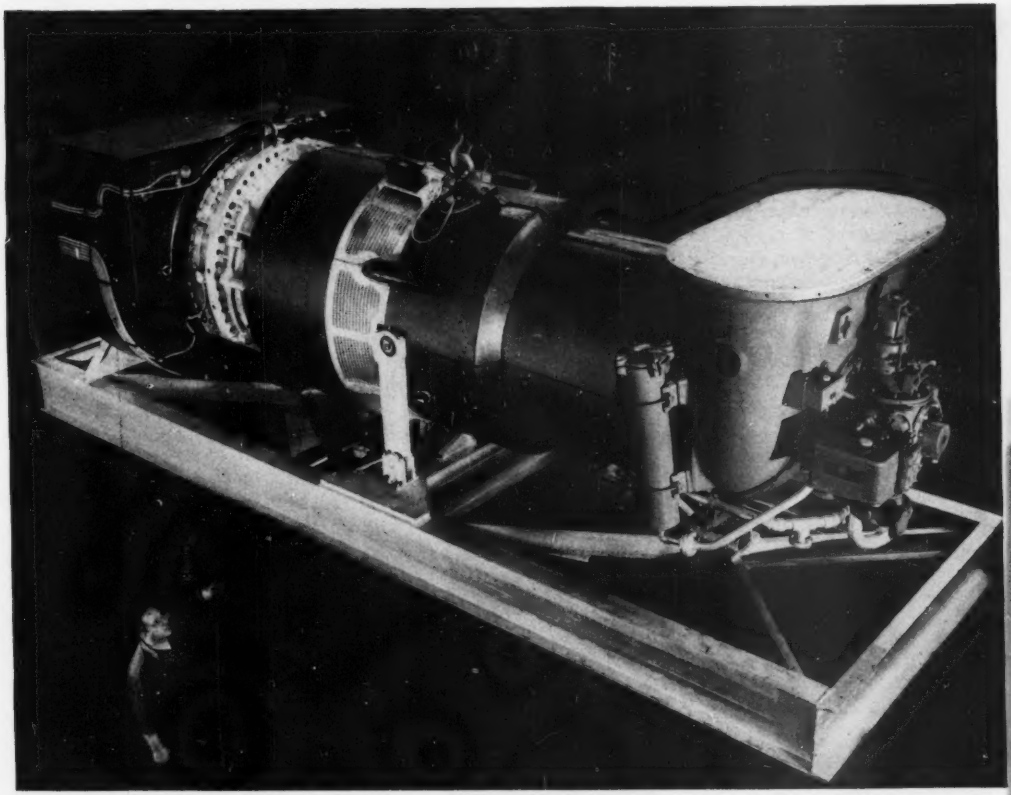
GAS TURBINES



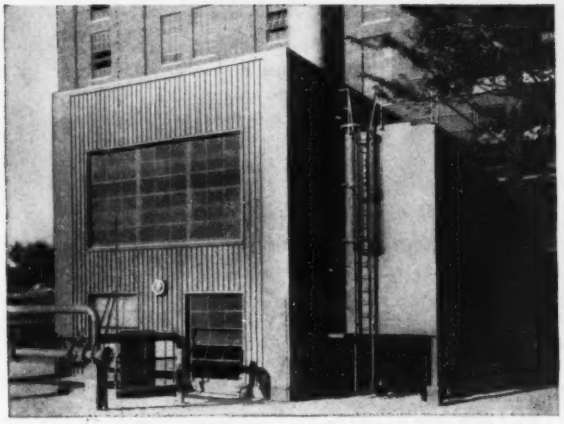
A COMPLETE POWER PLANT is yours with the compound-cycle gas turbine illustrated here. It is delivered with regenerator and intercooler and requires a minimum amount of cooling water.

GENERAL ELECTRIC

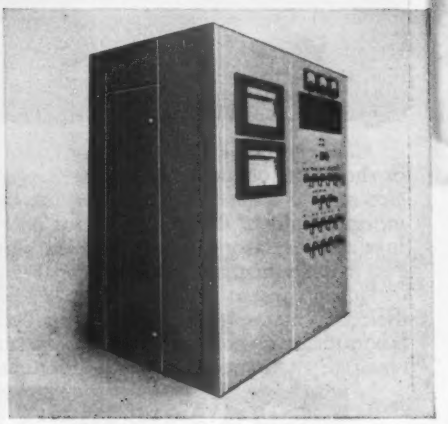
AT THE END OF THE LINE



EASY INSTALLATION is possible because of the compact design and relative light weight of the gas turbine. The components of the simple-cycle unit can be easily handled for inspection and assembly purposes.



THE SIMPLE BUILDING AND FOUNDATION required for a gas turbine installation makes possible substantial savings in initial cost for end-of-the-line plants. In this building, the gas turbine rests on a reinforced concrete slab.



EASE OF OPERATION is a big factor in end-of-the-line plants. The control unit shown here contains all instrumentation and control equipment for operation of the turbine.

A Range of Ten Billion to One

with this CAPACITANCE TEST BRIDGE

THIS Type 1611-A Capacitance Test Bridge represents an important advance in instrumentation with its increased accuracy, improved sensitivity and extra convenience in operation over test bridges formerly available through General Radio Company.

This bridge measures capacitance from 0 to 11,000 μf with an accuracy of $\pm$ (1% + 1 $\mu\mu$f) over the entire range.

Capacitance and Dissipation-Factor Dials *direct-reading through a single window; dials approximately logarithmic*

Unique Zero-Compensating Circuit *requiring no "zero" corrections for accurate determinations of capacitance and dissipation factor, even at lowest bridge values*

High Sensitivity . . . *capacitances between 100 and 11,000 μf can be balanced to a precision of at least 0.1%*

Excellent Dissipation-Factor Accuracy *of $\pm$ (2% of dial reading plus 0.05% dissipation factor) over entire range of 0 to 60% at 60 cycles*

Improved Detection Circuit *with single-stage amplifier and electron-ray tube as visual null indicator . . . circuit designed to be very sensitive at or near balance and insensitive off balance*

Polarizing Voltage *can be used through external connections up to 500 volts, d.c. One terminal grounded so that a-c operated power supply with grounded output can be used*

Uniform Power Delivered to Bridge . . . *four separate sources of proper impedance and voltage, each providing maximum safe power to bridge, automatically selected by multiplier ratio switch*

Type 1611-A
Capacitance Test Bridge
$440

This bridge is very useful for laboratory or shop tests on all kinds of paper, mica and electrolytic condensers. It is very useful for measurements of dissipation factor on bushings and insulators and electrical insulation. For measurements of dissipation factor and dielectric constant of both solid and liquid dielectric materials in chemical and plastic laboratories it provides a highly accurate, sensitive and convenient-to-use instrument.

GENERAL RADIO Company
275 Massachusetts Avenue, Cambridge 39, Massachusetts
90 West St. NEW YORK 6 920 S. Michigan Ave. CHICAGO 5 1000 N. Seward St. LOS ANGELES 38

The Only ULTRA HIGH PRESSURE Disconnect Switch

KEARNEY introduces a *Completely Revolutionary Design—*

NO CONTACT SPRINGS

The Exceedingly High Contact Pressure— 20 Times Greater Than Conventional Spring Action Switches—Provides Higher Conductivity—Cooler Operation.

Turn the page for more information about this new Ultra High Pressure Disconnect Switch

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant: Guelph, Ontario

.57A

This NEW KEARNEY

ULTRA HIGH PRESSURE DISCONNECT SWITCH with NO CONTACT SPRINGS!

The Only ULTRA HIGH PRESSURE DISCONNECT SWITCH in the Field Today

The many other advantages provided by the engineering innovations in this switch are set forth in a bulletin. Send today for 6-25.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Ave., St. Louis 10, Mo.
Canadian Plant: Guelph, Ontario

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

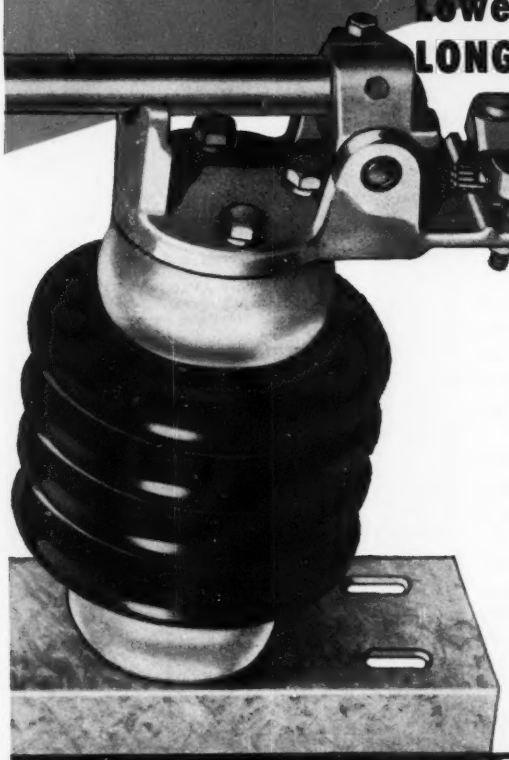
Specify KEARNEY Products . . .

Provides

HIGHER CONTACT PRESSURE

Which Means

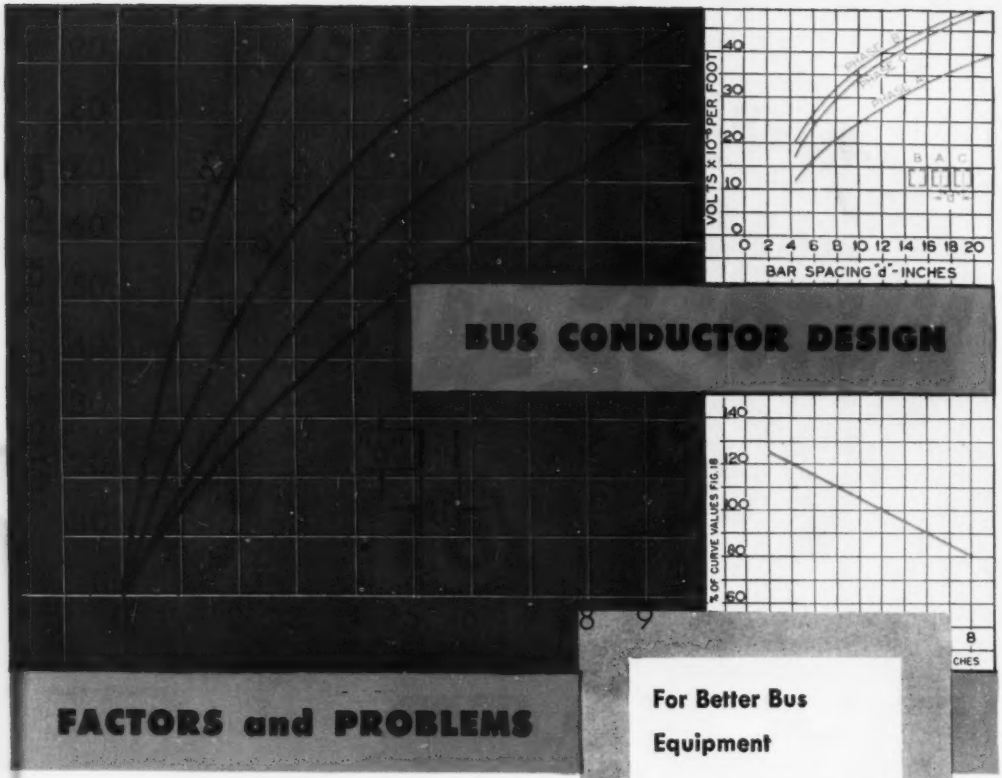
HIGHER CONDUCTIVITY
LESS OXIDATION
Lower Operating Temperature
LONGER SERVICE LIFE



There are many advantages in a springless contact switch. Springs, regardless of the metal from which they are made, are subject to fatigue, and their loss of original strength is a steady process. Obviously, a switch depending on spring-supported contact is doomed to a slow continuing loss of conductivity and eventually complete failure. This new switch has no contact springs to wear out. The mechanical advantage supplied by the Toggle Action also provides Positive Ice Breaking ability with little effort exerted by the lineman. The switch in the closed position is locked so tightly together that it is practically one solid conductor completely eliminating radio interference.

176

Better Construction— *SAFER* Maintenance



BUS CONDUCTOR DESIGN

FACTORS and PROBLEMS

Voltage Drop in Laminated Busses

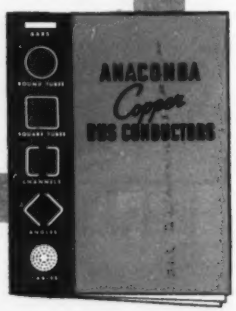
Voltage drop in A.C. bus conductors depends on a variety of factors, in addition to the size and shape of the conductors. By "interlacing" conductors of opposite polarity and minimizing space between phases, a laminated bus may be made to carry very heavy alternating currents at low voltage without excessive voltage drop.

The current-carrying capacity of an A.C. multi-bar bus depends on the cross-sectional shape and area of the copper bars, their total surface area, and their location relative to each other and to the return busses.

Our Technical Department will help you plan bus equipment for any requirement. Ask for the booklet, "ANACONDA Copper Bus Conductors." The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

For Better Bus Equipment

Much original research has been done by Anaconda leading to improved bus design and construction. Today ANACONDA *products and technicians are cooperating effectively throughout the entire field of power generation, distribution and application to provide bus conductors that will afford maximum capacity, security and economy for any specified job.*



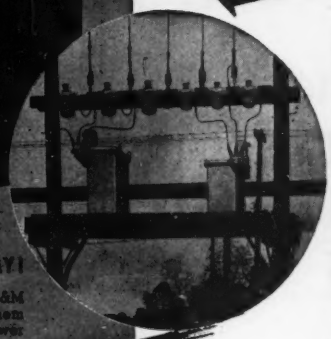
Carry the load with ANACONDA® Bus Conductors

EC&M Builds 2300 Volt Motor Starters IN UNIT-FORM

FOR SAFETY . . .

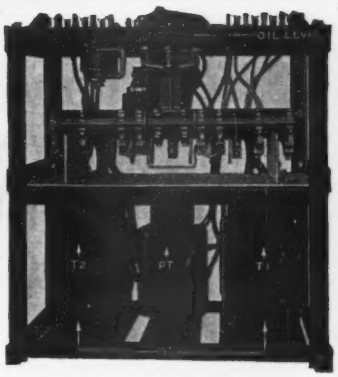
FOR CONVENIENCE IN INSTALLATION . . .

FOR LONG LIFE . . .



THEY COULDN'T RISK A DELAY!

Prominent oil refinery selected EC&M 2300 volt Starters and mounted them out-of-doors on platform between power poles.



Note clean-cut design of this reduced voltage starter mechanism for 2300 volt motors.

CLEAN-CUT DESIGN

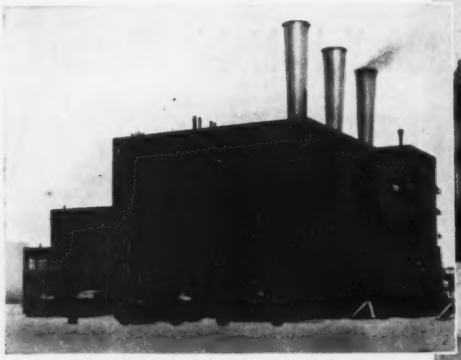
1. Single, quick-break, double-throw contactor operated by a single magnet.
2. Two liberally-rated auto-transformers marked T_1 and T_2.
3. Potential transformer (marked PT) for 220 volt push button circuit.
4. Current limit relay trips mechanical latch to transfer from reduced to full voltage.
5. Variable reactor on top of mechanism permits quick change of transition-setting, when desired.
6. Continuous torque acceleration.
7. High torque efficiency in starting.
8. Adjustable, magnetic type overload relays, arranged for magnetic reset from push button.

● In many plants, managements have come to know that EC&M Unit Starters are a valuable ally for their 2300 volt motor starting requirements. Complete enclosure of all high voltage parts not only provides a *shock-proof* installation but reduces time and material in installation. With the mechanism totally oil-immersed, operating parts are always lubricated and also protected from corrosion. Push button operation brings the motor up to speed with greater skill than human hands could do it. What could be safer—more reliable!

Ask for Bulletin 1047-C

THE ELECTRIC CONTROLLER & MFG. CO.

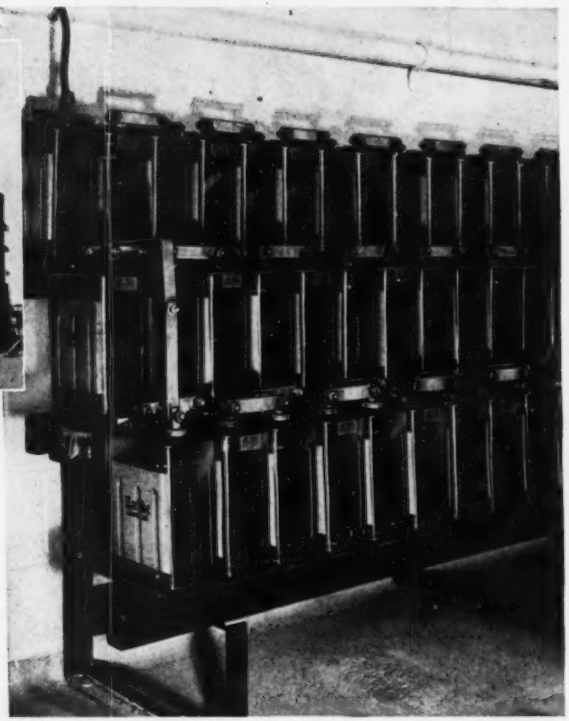
2698 E. 79th ST. ★ CLEVELAND 4, OHIO



Power house of Ford Motor Company's Buffalo Stamping Plant, Lackawanna, N. Y., equipped with Exide-Manchex Batteries for switchgear operation and emergency lighting.

Exide-Manchex

PROVIDES BATTERY POWER AT FORD'S BUFFALO STAMPING PLANT



Bank of 120-cell DME-9A Exide-Manchex Batteries mounted on Exide 3-step #37333 rack.

Efficiency of operation and equipment is characteristic of all departments of the great Ford Motor Company organization. Thus it is significant that the battery selected for the power house of their Buffalo Stamping Plant is an Exide-Manchex. This is the third Exide-Manchex at this plant, each a 120-cell DME-9A battery.

Throughout the country, in public and private power plants of all sizes, the Exide-Manchex is daily proving its dependability, long life, and economy. In Exide-Manchex Batteries you get:

POSITIVE OPERATION: Dependable performance at ample voltage with no switching failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for dependable performance of all other control circuits and also emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution needed during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding of equipment.

These are the features that help to make Exide-Manchex *your best battery buy* for all control and substation services.

• • •

LEAD CALCIUM BATTERIES

Exide first produced Lead Calcium Batteries in 1935. Since that time we have progressively followed an extensive program of laboratory research and development along with a study of Exide Lead Calcium Batteries in actual service.

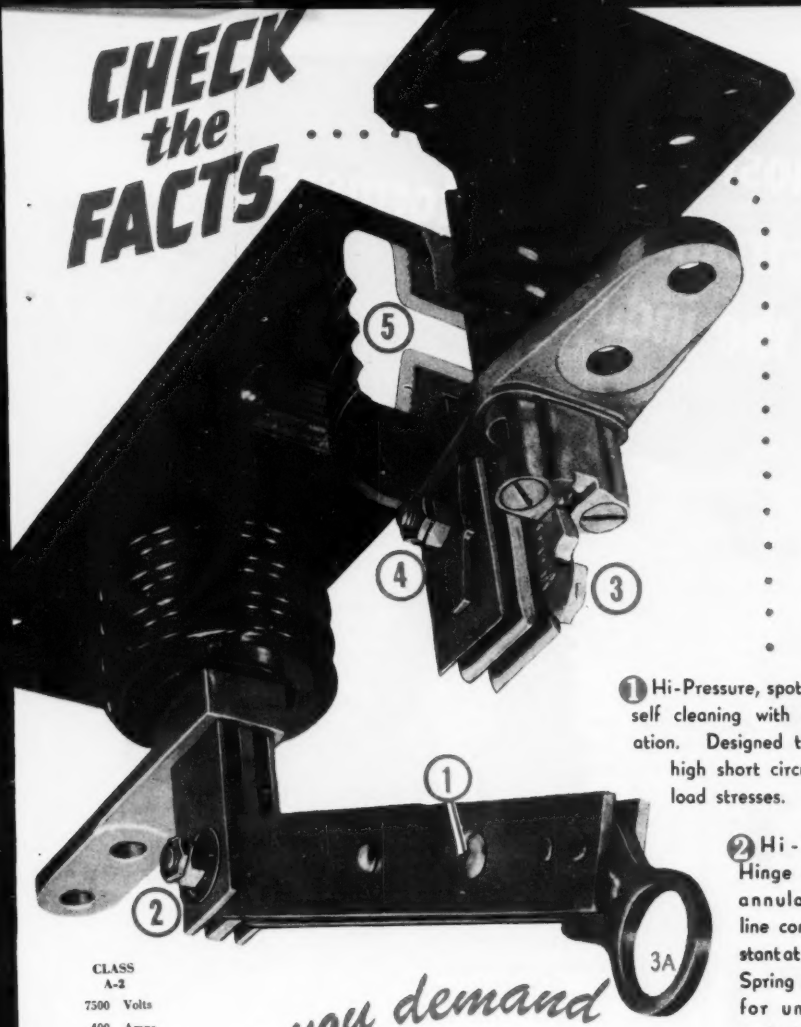
Much has been learned during those 16 years. Though the time is too short to specifically predict length of battery life, definite conclusions have been reached regarding proper application. We will be glad to inform you where these cells can satisfactorily serve.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. Trade-marks U.S. Pat. Off.*

1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

CHECK the FACTS



CLASS
A-2
7500 Volts
400 Amps.

Because you demand switch **RELIABILITY..**

1. Hi-Pressure, spot contacts — self cleaning with each operation. Designed to withstand high short circuit or overload stresses.

2. Hi-Pressure Hinge Contacts — annular, uniform line contact is constant at all positions. Spring cup washers for uniform ring contact loading.

3. Positive safety Latch — controlled by easy operating latch handle (3A), which has blade starting pry-out.

4. Contact Pressure Spring of Phospher Bronze — provides uniform spot contact loading.

5. Insulator bonded to hardware with resilient metal which provides for mechanical shock — jig set for accurate alignment.

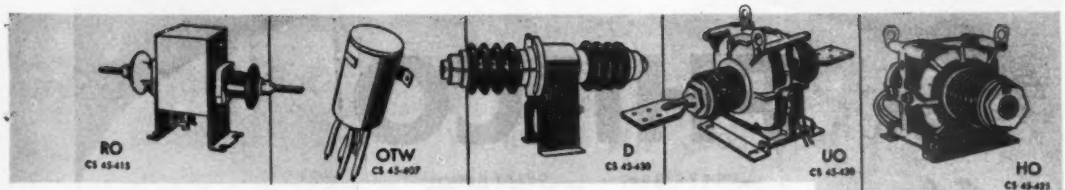
R&IE

RAILWAY and INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.
AFFILIATED WITH THE I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.
IN CANADA — EASTERN POWER DEVICES LIMITED, TORONTO

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

The most complete line of Instrument Transformers in the industry



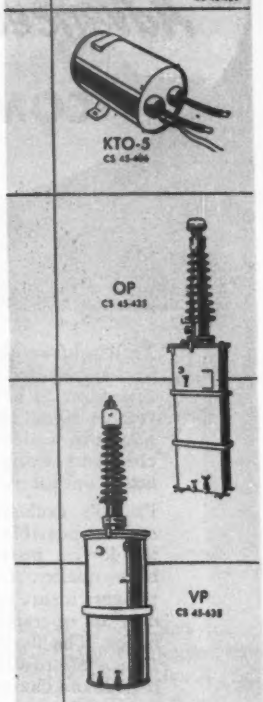
Specific answers for specific needs!

The complete line of Westinghouse Instrument Transformers contains a type and rating for every requirement.

For example, if you have a problem in accurate metering on a 69-kv line averaging 800 amps, the Westinghouse Types OCT-69 for current, OPT-69 (single or two bushing) for voltage, are designed to supply meters rated 5 amps and 115 volts.

The Types OCT and OPT have been designed especially for outdoor service. They are oil filled, have improved weather-shed bushings and have an element-resisting finish on metal surfaces. They are built to conform to the highest accuracy standards established by ASA. Similar types are available for a wide range of ratings.

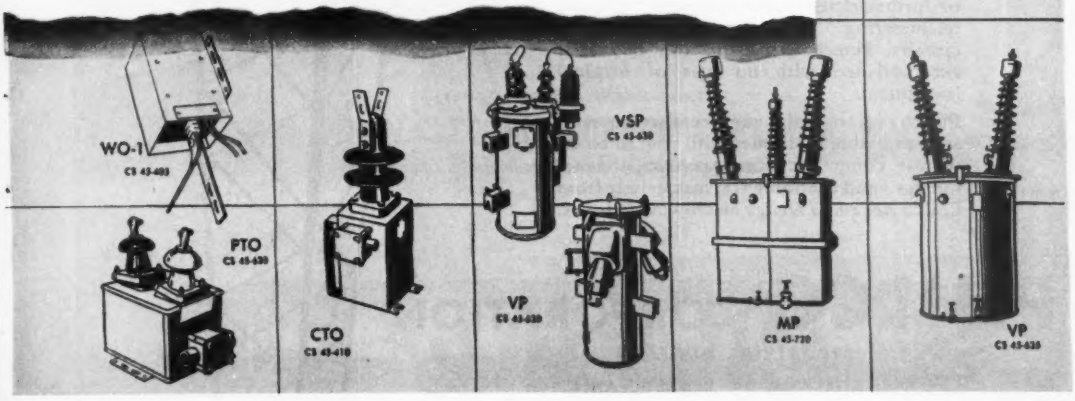
Others cover metering, relaying, indicating and auxiliary applications. For complete information on any of the types listed, ask your Westinghouse representative for a copy of the catalog identified by the "CS" number under each illustration; or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70589



YOU CAN BE SURE... IF IT'S

Westinghouse

INSTRUMENT TRANSFORMERS

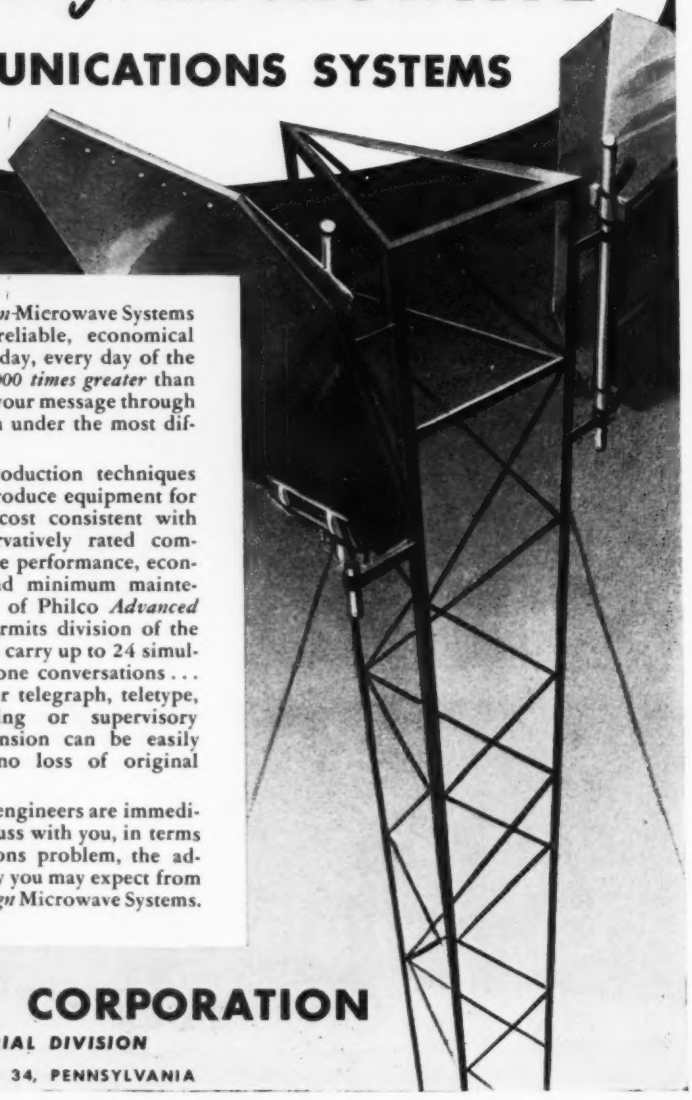


Don't Settle for Less Than . . .

PHILCO

Advanced Design MICROWAVE

COMMUNICATIONS SYSTEMS



Philco *Advanced Design* Microwave Systems are engineered for reliable, economical operation 24 hours a day, every day of the year. A signal level *1000 times greater* than normally needed gets your message through clear and strong, even under the most difficult conditions.

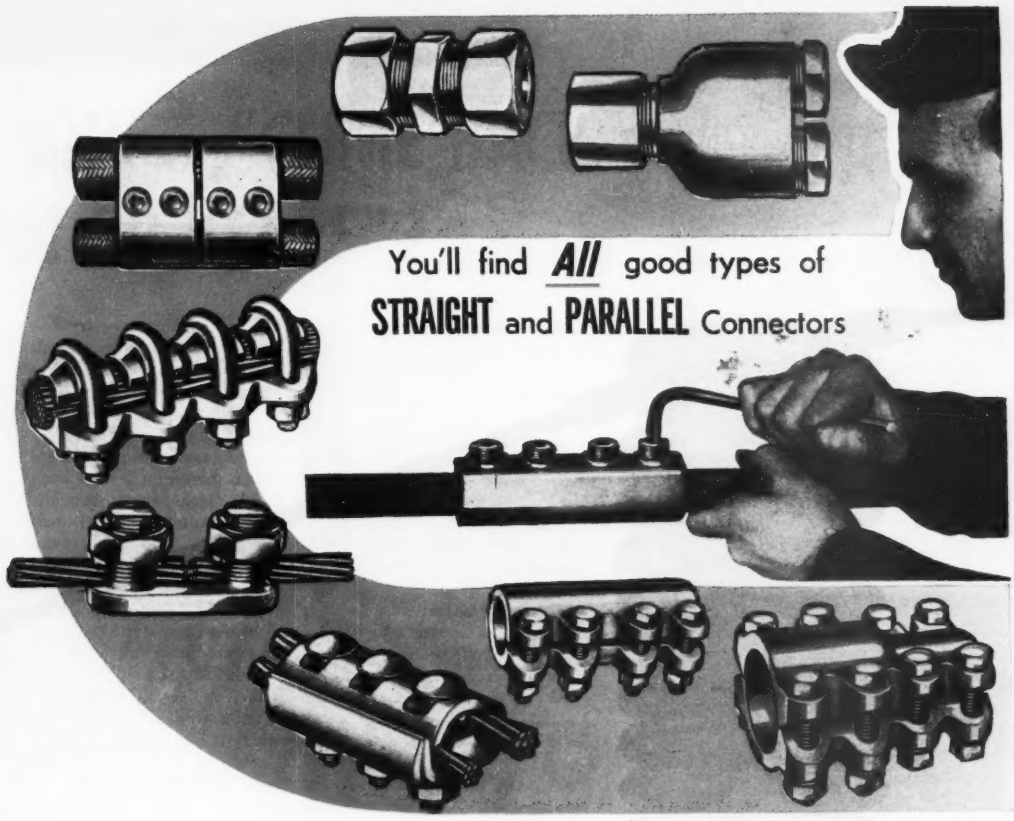
Philco's exclusive production techniques make it possible to produce equipment for the lowest possible cost consistent with high quality. Conservatively rated components insure reliable performance, economy of operation and minimum maintenance. The flexibility of Philco *Advanced Design* Microwave permits division of the broadband channel to carry up to 24 simultaneous 2-way telephone conversations . . . or further division for telegraph, teletype, telemetering, signaling or supervisory circuits. Future expansion can be easily accomplished with no loss of original investment.

Philco regional sales engineers are immediately available to discuss with you, in terms of *your* communications problem, the advantages and economy you may expect from Philco *Advanced Design* Microwave Systems.

PHILCO CORPORATION

INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA



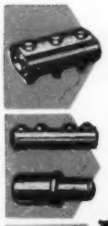
You'll find ***All*** good types of
STRAIGHT and **PARALLEL** Connectors

in the ***Complete*** line

Yes, it's mighty handy to open your Penn-Union Catalog and pick the exact type you need. They're all there—in a complete range of sizes; Bolted straight connectors . . . screw type . . . various split sleeve types . . . shrink fit . . . universal clamps . . . E-Z connectors with yoke and nut, etc.

The Penn-Union Catalog also gives you the *complete* line of service Connectors, Tees, Cable Taps, Grounding Connectors, Lugs, Power Connectors, etc.

Preferred by leading users—who have found that *"Penn-Union" on a fitting is their best guarantee of unfailing service.*



Sold by Leading Wholesalers

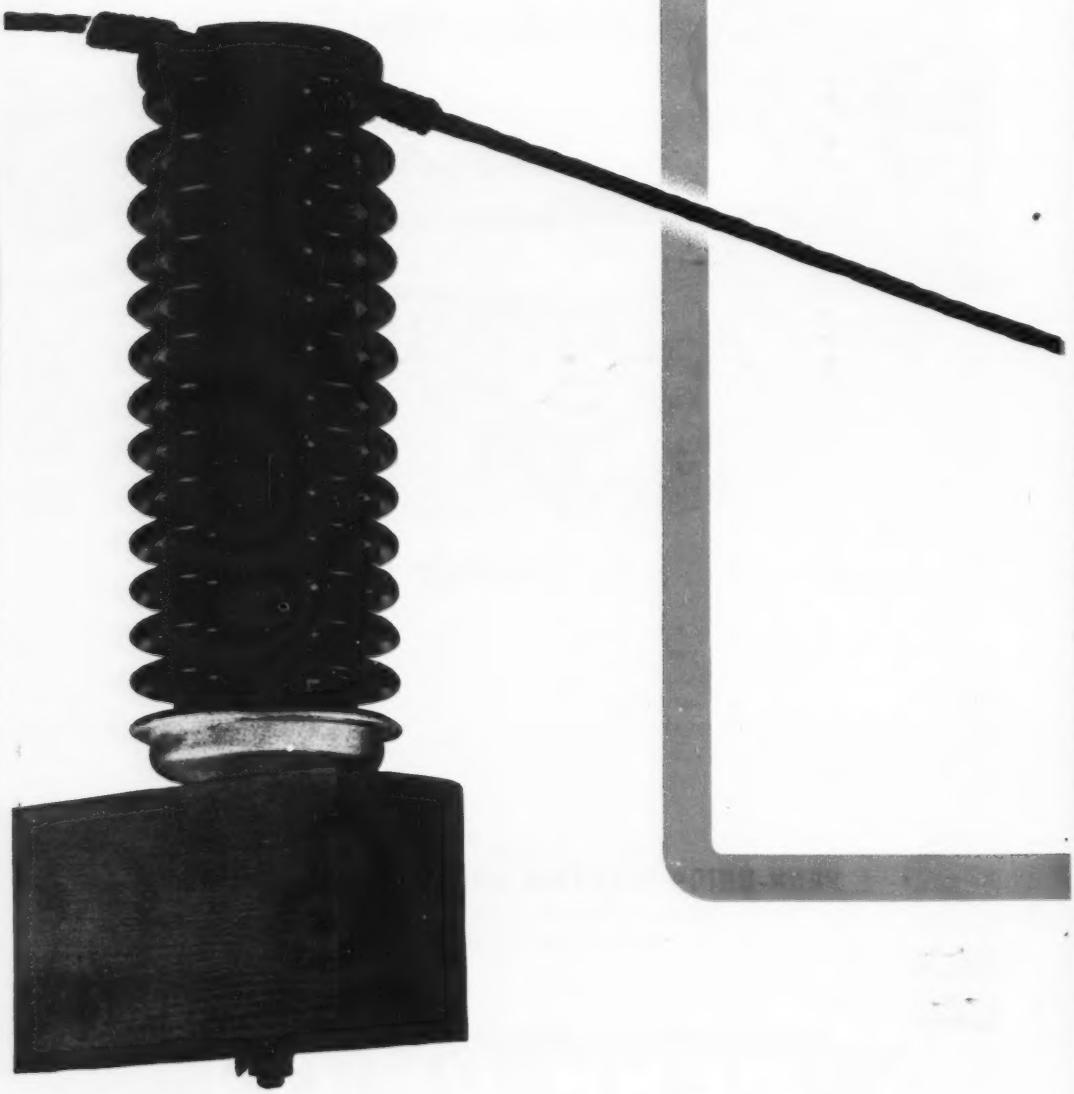
PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd.
250 Richmond St. West, Toronto

THE *Complete* LINE OF CONDUCTOR FITTINGS

PENN-UNION

DID



YOU SAY, "COME BACK IN 20 YEARS"?

When we introduced the Lapp Line Post, we were confident that its revolutionary new design was matched by a revolutionary new order of performance . . . that for power transmission it would provide an *extra* margin of operating security—electrically and mechanically.

We showed our new development to engineering and operating men in power companies across the land. We had back of us a good record of sound ceramic production, and we offered an engineering conception that added up to an amazing combination of characteristics. And most of the places we went we got an answer that boiled down to : "Looks good—almost too good. That makes it suspicious. Let's see how good it looks after 15 or 20 years of service."

That was in 1931. Now we're back, with 20 years of service to substantiate our claims. For in spite of a natural skepticism, we did get more and more Line Posts in service. At the beginning, most of them in "trouble spots," where lightning conditions were so bad . . . or the Kids such good marksmen . . . or salt fog or industrial contamination so persistent . . . or radio interference such a problem . . . that operating people were ready to "try anything."

How's the record? Our original claims are still good. No radio interference . . . no puncture . . . no cracking . . . no cleaning . . . greater resistance to stones and bullets . . . better performance under arcover. And, with 20 years to establish our right to these claims, a new one which sums them all up: *Lines on Lapp Line Posts have fewer outages, require fewer insulator replacements, and less maintenance than comparable lines on any other type of insulator.*

If you held off on the "untried" Line Post design, it's because you wanted to be *certain* about performance of the insulators on your lines. That makes you the fellow who should be most anxious to take advantage of the operating superiority of the *proved* Line Post design. It will make quite a difference in your company's operating and maintenance costs over the next 20 years.

Lapp

Choose More than a Truck

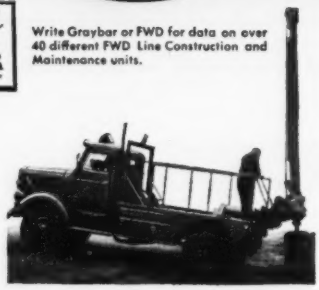
Choose an FWD that's Engineered for Utility Line Work

Distributed by Graybar Electric Company

Write Graybar or FWD for data on over 40 different FWD Line Construction and Maintenance units.

"Us linemen sure like an FWD. It gets us where we want to go with no 'crowding' . . . takes the tools we need with us and always has 'em handy. With an FWD —we're sure of getting there — and getting back."

"When my crews go out for line construction or maintenance—they pick the FWD to go with 'em every time. Seems it helps get more work done easier—in less time —and they go on and off the road with greater safety."



WHEN you choose an FWD — you choose more than a truck — you get a specially engineered utility service unit—completely equipped for the job. That means you'll get more jobs done in less time—easily meet routine schedules—restore service in emergency faster. Ask for the whole FWD story—about FWD utility-engineered models — four and six wheel drives. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory — Kitchener, Ontario. *World Wide Sales and Service.*

America's Foremost Heavy-Duty Truck

LOCKE

presents masterpieces of

insulator engineering

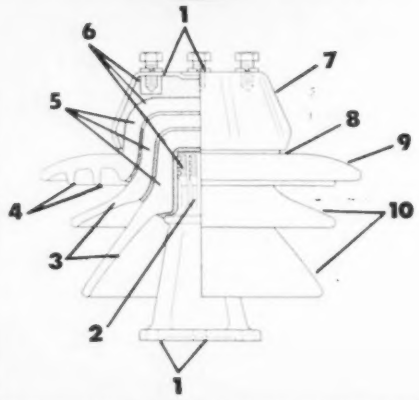
Switch to
LOCKE SWITCH & BUS INSULATORS
typified by

No. 7785

shown above . . . and first introduced by Locke in 1920 as the worthy successor to the industry's first high voltage switch-type insulator . . . originated by Locke in 1911. Today No. 7785 is probably the best known of Locke's large family of Switch & Bus Insulators . . . every member of which you'll find is a masterpiece of engineering in its own right. Always specify them.

Presenting A MASTERPIECE OF INSULATOR ENGINEERING

The LOCKE high voltage Switch Insulator



LOCKE DESIGN gives you ALL these advantages

1. Precision assembly jigs maintain positive alignment between tapped holes in the cap and bolt holes in the pin (or base). The top of the cap and bottom of the pin are parallel to within .015-inches. Such accuracy means easy assembly of switches or other apparatus mounted on them.

2. Vertical ribs on the inside of the caps and the outside of the pins provide high torsional strengths.

3. The Locke wet-process porcelain body—the toughest known—has been a standard of comparison since 1893. It is fully capable of withstanding power arcs, lightning flashovers and extremely rough handling.

4. The contours of the corrugations are such as to give maximum resistance to mechanical impact consistent with total weight and balanced electrical characteristics. The depth of the corrugations assure full leakage distance.

5. Locke Compression Sand at the cement joints adds to strength, and the stability of that strength, throughout the life of the insulator.

6. Non-hardening, resilient coatings, applied to all unsanded, load-carrying surfaces, distribute loading efficiently and act as expansion joints under temperature changes. This contributes to longer life.

7. Galvanizing is done by the exclusive Locke Permazinc process—a quality-controlled, double hot-dip method that assures the highest degree of resistance to weathering and corrosion.

8. In assembly the lower edge of the cap is held positively away from the porcelain. This provides an expansion joint which prevents thermal changes from causing high internal stresses in the insulator.

9. Compression Glaze—a Locke development—assures high resistance to damage from thermal shock or mechanical impact. This means that Locke insulators can be handled faster in construction without danger of chipping or breaking.

10. The uniformly smooth glazed surface assures easy natural cleaning by wind and rain, and aids the insulator in maintaining its originally excellent electrical characteristics.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke Insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Maryland.

LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

CUT INSULATORS

LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

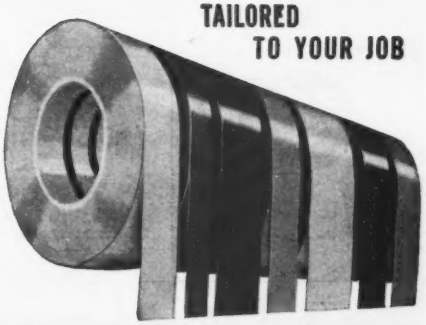
ENTRANCE BUSHINGS

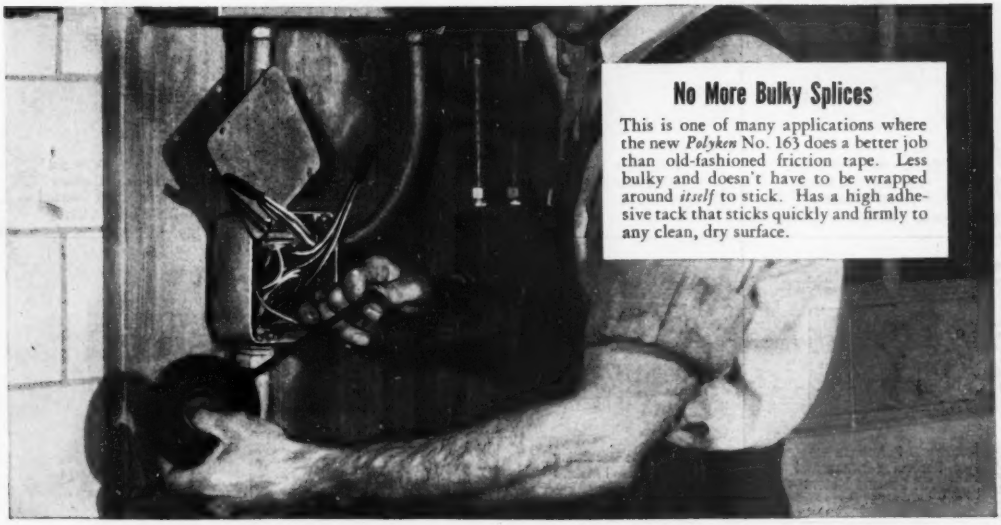
THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB





No More Bulky Splices

This is one of many applications where the new *Polyken* No. 163 does a better job than old-fashioned friction tape. Less bulky and doesn't have to be wrapped around *itself* to stick. Has a high adhesive tack that sticks quickly and firmly to any clean, dry surface.

After 70 years—an electrical tape that costs less than friction tape

This is the first new thing that's happened in the friction tape field in nearly a century—*Polyken* No. 163. An electrical tape that sticks to any surface as well as to itself. It has higher dielectric strength with less bulk. Forms a better moisture barrier.. Doesn't fray. Sticks better and is easier and cleaner to handle.

All this, new *Polyken* No. 163 brings you . . . yet costs less than old-fashioned friction tape! See your Polyken distributor today.

Polyken, Dept. EWJ, 222 West Adams St., Chicago 6, Ill.

For specifications and further information on this and other Polyken tapes, please send me your *FREE BOOKLET*, "Tape is a Tool."

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone____ State_____

***Polyken* Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

Single Phase
Detachable Meters

Single Phase
Bottom-Connected Meters

Polyphase
Detachable Meters

Polyphase
Bottom-Connected Meters

Combination Polyphase
and Thermal Watt
Demand Meters

Polyphase Thermal
KVA Demand Meters

Polyphase
Switchboard Watthour
Meter-Flexitest Case

Polyphase Switchboard
Combination Watthour
and Thermal Watt Demand
Meter-Flexitest Case

Polyphase
Recording Differential
KW Demand Meters

Polyphase Recording
KVA Demand Meters

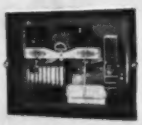
Polyphase
Totalizing Recording
KVA Demand Meters

Polyphase Indicating
KVA Demand Meters

Combination Polyphase
and Thermal KVA
Demand Meters

Polyphase KVA Demand
Impulse Senders

Polyphase Impulse
Operated Recording
KW Demand Meters



Polyphase Impulse
Operated Recording
KVA Demand Meters

Single Phase
Varhour Meters

Block Interval
KW Demand Registers—
Indicating and Cumulative

Phase Shifting
Transformers

Portable Standard
Watthour Meters

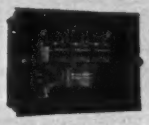
Combination Single Phase and Thermal Watt Demand Meters

There's a Westinghouse meter for every application!

Polyphase Recording Demand Meters

Polyphase Switchboard Totalizing Watthour Meter-Flexitest Case

Single Phase Combination Watthour Meter and Time Switch



Impulse Totalizing Relays

Forecasts of unprecedented load growth in the coming years suggest many changes in metering practices. That's why a *complete* line of metering equipment holds an advantage for you. Specifically . . .

It's assurance that your *future* as well as your present needs can be readily fulfilled.

The wide variety of meters illustrated here is typical of the broad line of Westinghouse Meters offered to you. These and many more types are available to give you low-cost metering for every circuit application . . . three wire, four wire, wye or delta, or totalizing.

To meet your expanding needs Westinghouse has continually pioneered new devices to make the desirable changes in metering methods a practical reality. And you have assurance of dependability because every Westinghouse Meter contains the quality and refinements that result from the engineering of a complete line. So whether your needs involve metering large loads or small, single or polyphase circuits, kw or kva, Westinghouse can meet your requirements.

For more information write for Booklet B-4665. Call your Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40408

YOU CAN BE SURE.. IF IT'S Westinghouse METERS

SPLIT SECOND OPERATION WITH CRYSTAL VALVES!

TRUE VALVE ACTION ASSURES CONSTANT PROTECTION

You get maximum, efficient protection for transformers and other electrical equipment when you install Crystal Valve Arresters. True valve action assures split second operation, preventing "black-out" of service to consumers.

Crystal Valves withstand the ravages of weather extremes, and are long lasting in service. All of the desired characteristics of ideal lightning arrester protection are incorporated. Oxidized Silicon Carbide grain found only in Crystal Valves provides an additional margin of protection.

- Low IR Voltage drop
- Ample surge discharge capacity
- Extremely marked valve action for follow current interruption
- No measurable deterioration
- Long service

Reduce your maintenance and operating costs, protect your power line equipment by installing Crystal Valve Arresters.

Write Dept. 1709 for latest technical data on lightning arresters and their installation. Ask for CV catalog.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Valve Elements and Spark Gaps must be Coordinated

by

J. R. McFarlin, Vice President

ELECTRIC SERVICE MANUFACTURING CO.

In a previous talk about non-linear valve element of valve type arresters it was pointed out that their resistance will be high when subjected to low voltage or current and low when subjected to high voltage or current; these changes are cyclical—not permanent.

In another talk spark gap elements and assemblies were briefly discussed. A lightning arrester embodies generally a spark gap assembly in series with a valve element; its primary function is to protect insulation from high voltage; its secondary function is to interrupt system current that may follow a lightning discharge through the arrester to ground; the spark gap and valve element play important parts in these two functions and for highest arrester efficiency must be properly coordinated.

A lightning arrester will perform a cycle of operation if it has a spark gap assembly having a *very low* impulse sparkover voltage in series with a valve element having a *very high operating* resistance, but protection to insulation will suffer due to high voltage built up across the valve element; an arrester will also perform a cycle of operation with a multi-gap spark gap assembly having a *very high* impulse sparkover voltage in series with a valve element having a *very low* resistance; but again protection to insulation will suffer, this time due to high impulse sparkover of the gap assembly. In both of these cases it may be assumed that any flow of system follow current will be interrupted.

A lightning arrester consisting either of a spark gap structure alone or a valve element alone, or with extremes of either in combination with the other cannot be made to function properly and efficiently on modern circuits; both must be used, the one to assist the other in the proper performance of its two operating functions.

Knowing the requirements the designer must compromise between impulse sparkover voltage of the gap assembly and the current resistance characteristics of the valve element and secure a balanced structure which will efficiently protect insulation from the standpoint of impulse sparkover and IR voltage of the valve element, plus ability to satisfactorily interrupt system follow current flows. Proper coordination of these functions results in a good arrester; improper coordination in a poor arrester.

Due to the highly efficient spark gap assembly of the Crystal Valve Arrester and the oxidized silicon carbide valve element used only in this arrester, a most excellent degree of coordination between the two has been attained; this in addition to other factors is responsible for the world-wide recognition which these arresters have enjoyed for many years.

(*Advertisement*)

Towers

BY AMERICAN BRIDGE

● The fabrication and erection of steel towers is an important part of our business.

You'll see American Bridge Company towers dotting the landscape around the world . . . and especially here in our own country, where power and communication are the life blood of practically all activity. For these are the towering steel signposts of progress!

If you need transmission towers, radio or television towers, mooring masts, tramway towers—even wind turbine towers, you'll find it to your advantage to submit your requirements to American Bridge. Our more than a half century of experience in designing, fabricating and erecting towers of all types and for all purposes can save you both time and money.

AMERICAN BRIDGE COMPANY

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN BRIDGE

UNITED STATES STEEL

No. 4- hook-operated...

★ *The Type H-U Hi-Voltage Hook-Operated Disconnecting Switch is a single-throw switch for vertical mounting in outdoor service.* It is available in capacities from 400 to 2,000 amperes, 7,500 to 115,000 volts.*

The Type H-U embodies design characteristics that guarantee *certain operation* anytime . . . under any condition . . . even after years of standing idle. Four features are outstanding:

1—Independently hinged blades
2—Stainless steel contact springs
3—Silver-nickel contacts
4—Pry-off lock action

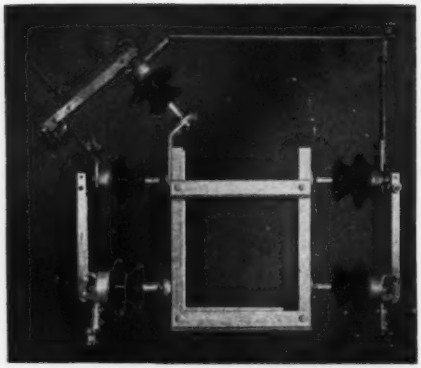
Look over these advantages on the opposite page. They are in keeping with the traditional high quality and positive performance assured by all Hi-Voltage Switches . . . they are reasons for the continued superiority of Hi-Voltage in the air-switch field.

And any Hi-Voltage design reduces switch installation cost from 20 to 40%, because the mechanism is completely pre-machined and prefitted at the Factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated.

Specify Hi-Voltage and gain the advantages of lower installation costs and certain operation.

Future advertisements in this series will discuss the merits of other types of Hi-Voltage Switches. In the meantime, let your Joslyn Representative give you the whole story.

**Also available for underhung mounting and in double-throw and transfer designs for either vertical or underhung mounting.*

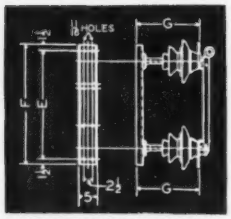


Many special arrangements can be made with Hi-Voltage Hook Switches. Above is shown a compact, economical unit that can be mounted on a beam or girder. Two standard Type H-U's are combined with a by-pass switch that is operated by a lever hinged on the blade.

A 2000-ampere switch is shown here. Note its heavy-duty construction. Contact pressure is maintained and evenly distributed by six stainless steel compression springs at each end of the blade . . . still the best means of assuring correct contact pressures with no undue wear of the silver contacts.

Hi-VOLTAGE

type H-U disconnecting switch



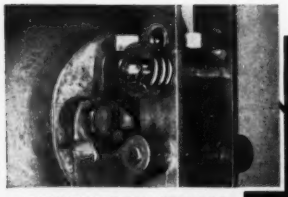
TYPE H-U HOOK-OPERATED SWITCH FOR VERTICAL MOUNTING

TYPE H-U HOOK-OPERATED SWITCHES

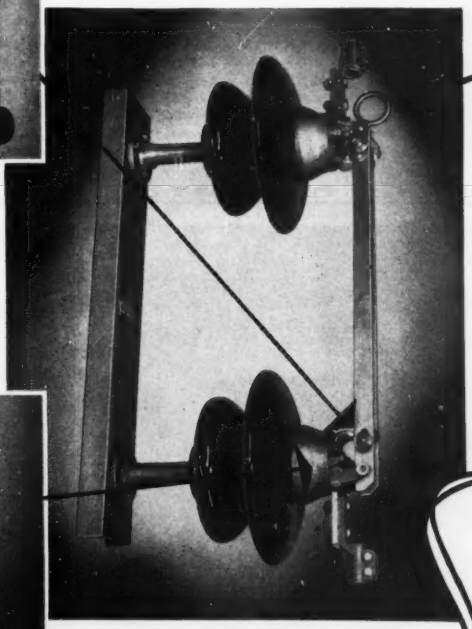
VOLTAGE	DIMENSIONS IN INCHES		
	E	F	G
7,500	18	21	9⅝
15,000	21	24	12⅛
23,000	24	27	14⅛
34,500	30	33	17⅛
46,000	38	41	20¼
69,000	50	53	31¼
115,000	As required		51¾

Hi-Voltage SWITCHES ARE AVAILABLE

from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.

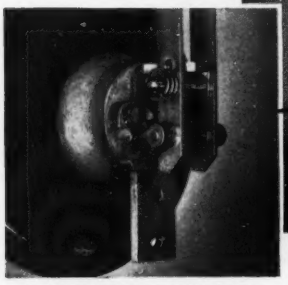


STAINLESS STEEL CONTACT SPRINGS—On all switch models, contact pressure is maintained by stainless steel compression springs of ageless flexibility. Moisture cannot rust them nor interfere with the maximum conductivity they develop.



PRY-OFF LOCK ACTION assures easy opening under ice conditions and when switch location necessitates a pull with the switch stick almost parallel to the blade.

SILVER-NICKEL CONTACTS welded to copper on 600 to 2,000-ampere switches . . . your guarantee of permanent conductivity and non-gauling, corrosion-proof performance.



INDEPENDENTLY HINGED BLADES operate entirely independent of the hinge-end contact. Thus, misalignment which sometimes results from installation can never affect their smooth operation and positive conductivity.

ALSO AVAILABLE!

Grounding Switches
Manual and Automatic Control Mechanisms
Mechanical Interlocks
Hi-Voltage Fuses
Cross-arms and Mounting Frames
And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO

Stronger . . . safer . . . and money-saving, too!

CHEVROLET Advance Design TRUCKS

Strength to carry your loads . . . power to *move* your loads and *keep* moving them . . . extra features that add up to more service, safety, operating comfort and economy! These new Chevrolet trucks offer you more of the things that count on the job . . . more of the money-making, money-saving features you want and need on jobs that test a truck's real value. Check what Chevrolet trucks offer and see for yourself. Valve-in-head engines that squeeze more power from every drop of gas. Self-energizing brakes for extra stopping power—greater safety. Wide-base wheels for increased tire mileage. These new Chevrolet trucks even offer extra driver comfort—with new cab seats and Ventipanes. But learn all the facts now. See the new Chevrolet Advance-Design trucks at your dealer's today.

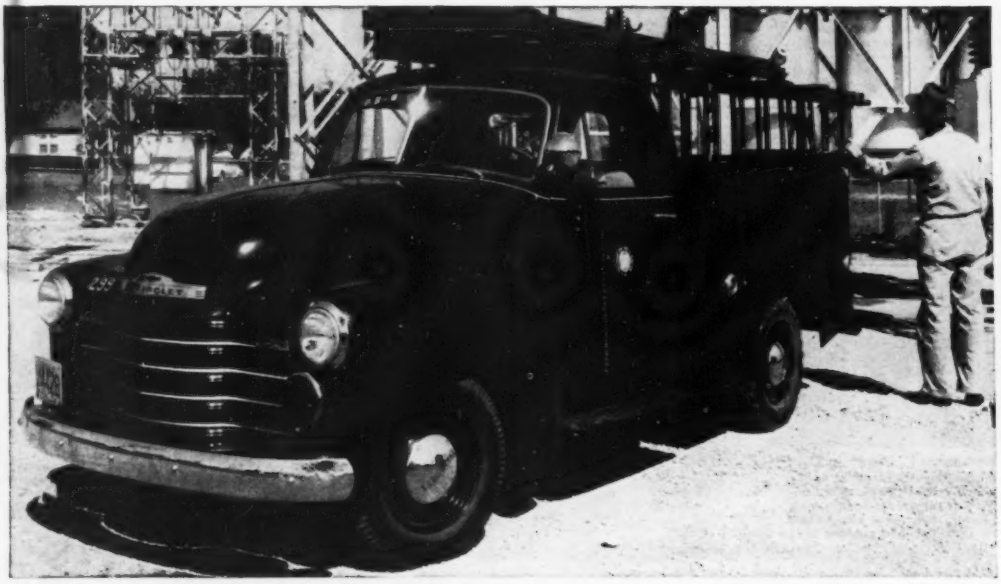
CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

First in demand
First in value
First in sales

CHEVROLET

ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the 105-h.p. Loadmaster or the 92-h.p. Thriftmaster—to give you greater power per gallon, lower cost per load • **POWER-JET CARBURETOR** — for smooth, quick acceleration response • **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement • **SYNCHRO-MESH TRANSMISSIONS** — for fast, smooth shifting • **HYPOID REAR AXLES**—for dependability and long life • **NEW TORQUE-ACTION BRAKES**—for light-duty models • **PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES** — for medium-duty models • **NEW TWIN-ACTION REAR BRAKES** — for heavy-duty models • **NEW DUAL-SHOE PARKING BRAKE** —for greater holding ability on heavy-duty models • **NEW CAB SEATS**—for complete riding comfort • **NEW VENTIPANES** — for improved cab ventilation • **WIDE-BASE WHEELS**—for increased tire mileage • **BALL-TYPE STEERING**—for easier handling • **UNIT-DESIGN BODIES**—for greater load protection • **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.



You get GREATER ultimate strength

in L-M's new reinforced wireholder

L-M's new wireholder is as tough and strong as they come. In over-all comparative tests it exceeded most others tested based on both dead-end pull and 90° side pull.

It was developed only after extensive tests of a number of designs, in order to give you the greatest possible ultimate strength.

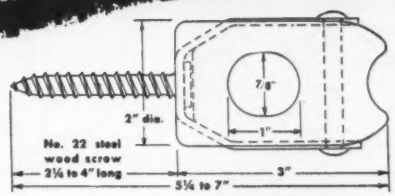
Screw is long, sharp, firmly fixed—with choice of screw lengths from 2¼ to 4 inches. With porcelain base directly against the wood, there is less danger of cracking the porcelain than when it is in contact with a metal ring. Porcelain has a good, well-rounded design, to avoid abrasion of wire.

It's a good wireholder, typical of the many line construction materials L-M offers.

COMPARATIVE STRENGTH TESTS

TYPE AND MAKE OF WIREHOLDER	AVERAGE ULTIMATE STRENGTH, POUNDS	
	Dead End Pull	Side Pull, 90°
L-M New	1800 lbs.	1600 lbs.
L-M Old	1750	1500
Make A	1600	925
Make B	1100	975
Make C	2300	825
Make D	1800	925

IMPROVED DESIGN OFFERS GREATER RESISTANCE TO DEAD-END AND SIDE PULL



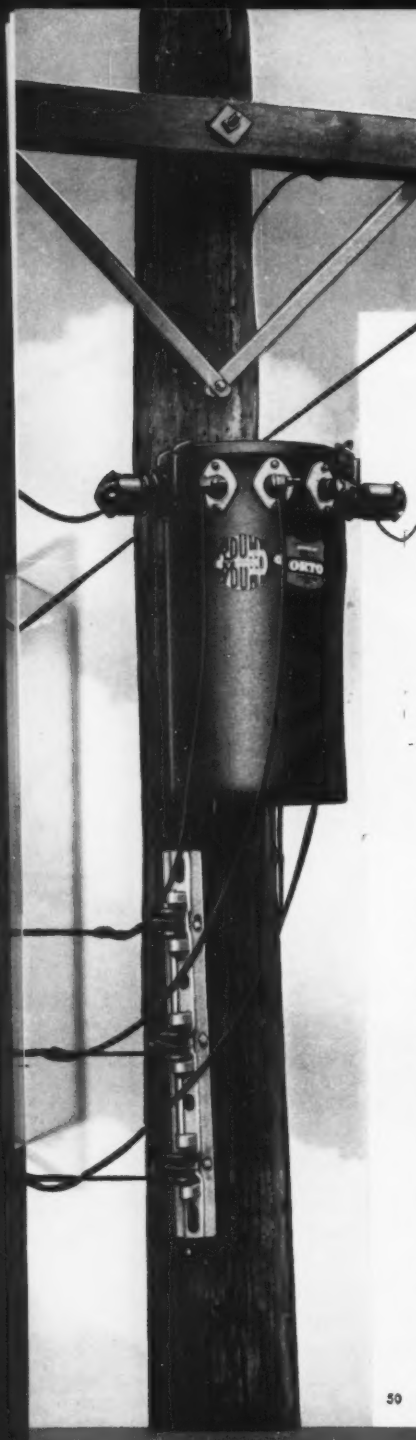
Want samples, prices?

Ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL
Line Construction Materials

LM®

Complete Coordinated Equipment for Distribution Today



Another Example of L-M Leadership

L-M's ORTO

(*oxidation-resistant transformer oil*)

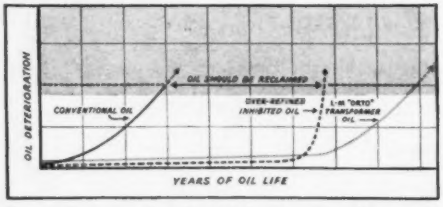
gives you all these advantages:

- longer life for the transformer, with the same overload capacity, or . . .
- higher overload capacity with the same transformer life
- reduced oil acidity and sludging
- maintained high impulse strength

and

- ORTO mixes with any other oil, conventional or inhibited
- ORTO will not react with other inhibitors
- ORTO is available as a *concentrate* for adding to your present oil stocks, for adding to power transformer oils, and for prolonging the life of reclaimed oil

Since its announcement, which led the industry, ORTO® has been a phenomenal success. Naturally L-M and L-M research engineers are gratified by ORTO's acceptance and this acceptance was deserved, by the long, rigorous careful checking into oils and inhibitors. New accelerated test methods were developed, to make sure that ORTO was as good as expected. ORTO was thoroughly tested and proved by extensive investigation and accelerated life tests representing many years of service.



Comparative curves show the deterioration of transformer oil in service. A high-grade conventional oil deteriorates at a gradually accelerating rate. Over-refined oils may have a better response to the inhibitor; but once the inhibitor has been used up, the oil has little resistance to oxidation, and deteriorates rapidly. ORTO brand oil is a high-grade conventional oil with an inhibitor which greatly extends the beginning of the deterioration, which, when it finally starts, assumes the same gradual curve as with any high-grade conventional oil.

Ask the L-M Field Engineer for information on ORTO; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

50

LINE MATERIAL . . . Transformers

Complete Coordinated Equipment for Distribution Today

L-M's new EEI-NEMA...standard subway transformer gives you ROUND-WOUND construction *Plus*...

- reduced tank cross-section for smaller manholes
- cover-mounted high voltage wiping sleeves
- sidewall-mounted low voltage bushings with spade-type terminals
- sealed construction with welded cover
- gasketed handhole
- unexcelled performance—low losses; high short-time overload capacity
- ORTO®—Oxidation-Resistant Transformer Oil—inhibited for longer life

L-M's Round-Wound® Subway transformers fully meet the new EEI-NEMA standards. They are now available. In addition to having the well-known advantages of L-M Round-Wound design, they take less vault space, have better sealing, offer greater ease in making connections, and have the advantage of being filled with L-M's ORTO.

Get the whole story! Ask the L-M Field Engineer for details; or write Line Material Co., Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

31

LINE MATERIAL...Transformers

Complete Coordinated Equipment for Distribution Today

Now in Production

HERE THEY ARE!

L-M's startling new type PHD

5 KV HEAVY DUTY CUTOUTS

Up to 20,000 amperes interrupting capacity

Interchangeable doors—standard, heavy duty, and switch blade types

50 and 100 ampere doors fit your present PVD® cutouts.

Here is the first and only complete line of cutouts for high power capacity distribution feeders—a complete line of type PHD 5 kv cutouts in 50, 100, and 200 ampere ratings, and with interchangeable doors in each rating.

These cutouts provide high interrupting capacity *as you need it*, without the extra cost for needless high *continuous* current rating. They are guaranteed to operate through the full range of fault currents.

Now you can install one of these new L-M cutouts with standard duty doors. As feeder load requirements change and fault currents increase, just make a heavy duty cutout out of it, by hooking on the heavy duty door. Doors for the 50 and 100 ampere cutouts also fit your *present* PVD's—so you can change those into heavy duty cutouts with these new doors! Switch blade door, either stationary or indicating, converts cutout into a disconnect switch in just 6 seconds. Warehousing and stocking are all greatly simplified!

OUTSTANDING DESIGN FEATURES

- **Housings wet-process porcelain, glazed inside and out.**
- **Hanger supports cemented into back of porcelain housings.**
- **All current carrying parts silver plated.**
- **New clamp type terminals with easily accessible large-head screws.**
- **Replaceable "bakelined" fuse cartridge tubes resist weathering and arcing.**
- **Spring-actuated flip-out device pulls fuse link down and out of tube, assuring instant separation of link parts, even with the smallest links and low fault currents.**

1. standard duty door—1200 amperes interrupting capacity

2. heavy duty door—8000-5000 amperes interrupting capacity

3. switch blade door—100 amperes continuous current rating

L-M HEAVY DUTY CUTOUTS			
RATING	DOORS AVAILABLE	INTERRUPTING CAPACITY rms amperes 2.5 kv*	5 kv**
50 AMPERES	1. Standard duty, indicating	1,200 amp.	1,200 amp.
	2. Heavy duty, non-disconnecting	8,000 amp.	5,000 amp.
	3. Switch blade	100 amperes continuous current rating.	
100 AMPERES	4. Standard duty, indicating	3,000 amp.	3,000 amp.
	5. Heavy duty, non-disconnecting	14,000 amp.	10,000 amp.
	6. Switch blade	200 amperes continuous current rating.	
200 AMPERES	7. Heavy duty, indicating	20,000 amp.	15,000 amp.
	8. Switch blade	400 amperes continuous current rating.	

* or line-to-neutral 4160 or 4330 volts Gr. Y. ** or line-to-neutral 8330 volts Gr. Y.

Engineered for Safety

The lineman can remove the door completely, refuse and replace it, all with a switch stick. When door is open, all door parts are dead.

Get the Whole Story

Ask the L-M Field Engineer for more information or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

PHD is a Line Material Trademark

14,000 amperes interrupting capacity for **100** ampere cutout

20,000 amperes interrupting capacity for **200** ampere cutout

4. standard duty door—3000 amperes interrupting capacity

5. heavy duty door—14,000-10,000 amperes interrupting capacity

6. switch blade door—200 amperes continuous current rating

7. heavy duty door—20,000-15,000 amperes interrupting capacity

8. switch blade door—400 amperes continuous current rating

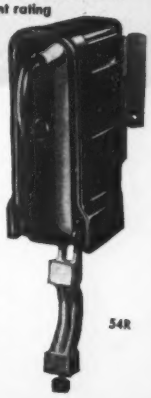
LINE MATERIAL

fuse cutouts

Complete Coordinated Equipment for Distribution Today

400 ampere disconnect switch in indicating position

Through the use of this new, higher-rated switch blade, the 200 ampere cutout can now be converted simply and quickly to a 400 ampere disconnecting switch for use on higher nominal current systems. Door can be closed with hinged blade in disconnect position below the box, giving positive indication that the line is open—a unique L-M feature.



54R

The Tea Party Proves *it's SAFE here!*

We're sure that the utility didn't propose this substation as a public playground. But with its location in the heart of a young residential area, they knew it had to be safe. That's why they installed a Westinghouse "CSP"* (Completely Self-Protecting) Power Transformer with underground lines. It makes a compact, completely enclosed single-feeder unit substation . . . so safe that it may be installed without special fences or guardrails. There are other, greater economies, too:

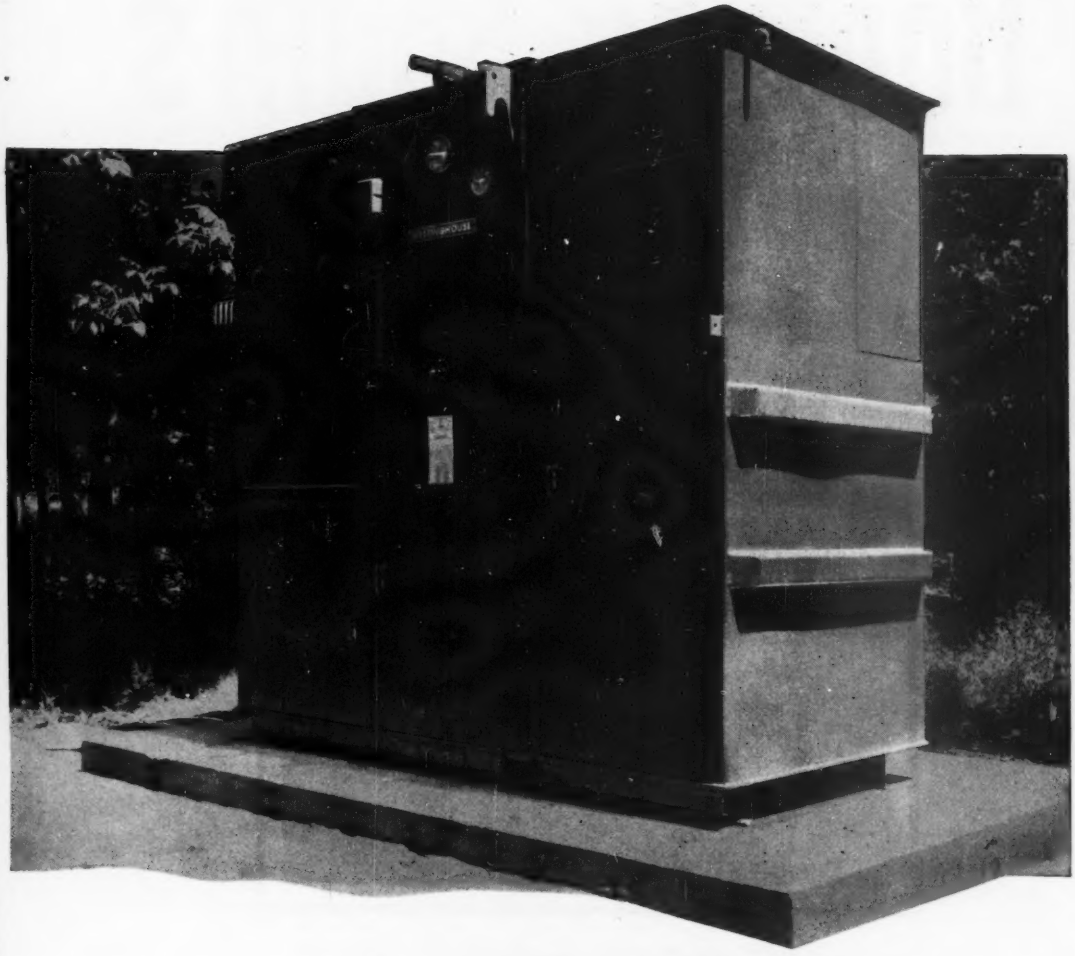
You save when you order. Specify and order just one complete unit . . . instead of 35 to 45 components.

You save when you install. Simply lay a mat, set the unit in place, and tie it in. No co-ordinating or separate mounting problems! No overhead structures! No protective barriers!

You save on maintenance and long-run operation. It's a "CSP" unit, with built-in protection. It will handle short-time overloads without service interruption and will save itself from burnout if the load becomes dangerous.

For further information, ask your Westinghouse representative for a copy of booklet B-4292, "Single-Feeder Unit Substations that are Completely Self-Protecting", or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70603



YOU CAN BE SURE... IF IT'S

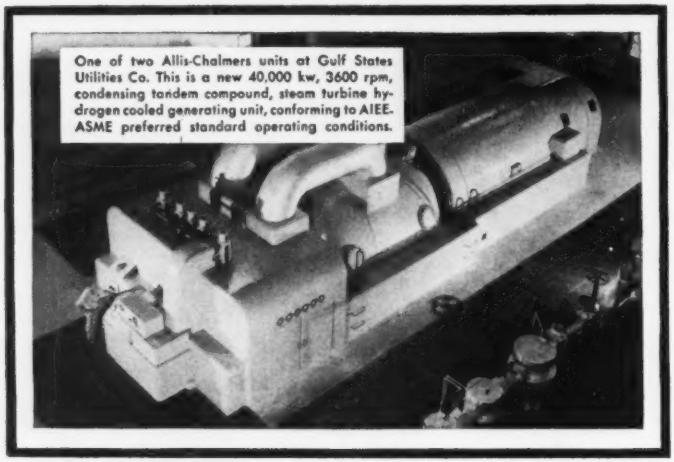
Westinghouse

"CSP" POWER TRANSFORMERS

SINGLE FEEDER UNIT SUBSTATIONS

Booming South's Power Needs Met by

STEAM TURBINE GENERATORS!



One of two Allis-Chalmers units at Gulf States Utilities Co. This is a new 40,000 kw, 3600 rpm, condensing tandem compound, steam turbine hydrogen cooled generating unit, conforming to AIEE-ASME preferred standard operating conditions.

BOOM COUNTRY DEMANDS POWER and Allis-Chalmers turbine generator units in the Riverside Station of the Gulf States Utilities Company help service the mushrooming industrial and agricultural empire in southwest Louisiana.

More than 662,000 people live in the area served exclusively by Gulf States, ranging from Baton Rouge to across the Brazos river in Texas. In the last decade its customers have more than doubled and power consumption has more than tripled.

A 75,000 kw station, near the port city of Lake Charles, Louisiana, is the central generating station of the Gulf States system.

In 1947 an Allis-Chalmers 35,000 kw steam turbine generator unit was installed. This was followed by a larger 40,000 kw unit in 1950.

Helpful Information Available

When you plan the installation or expansion of a steam-electric power plant, let Allis-Chalmers simplify your problem. This *one* source will provide you with a *complete* range of quality power plant equipment. Bulletin 03B6801A on standardized steam turbine units and literature on all products listed below are now available to help you make your selection.

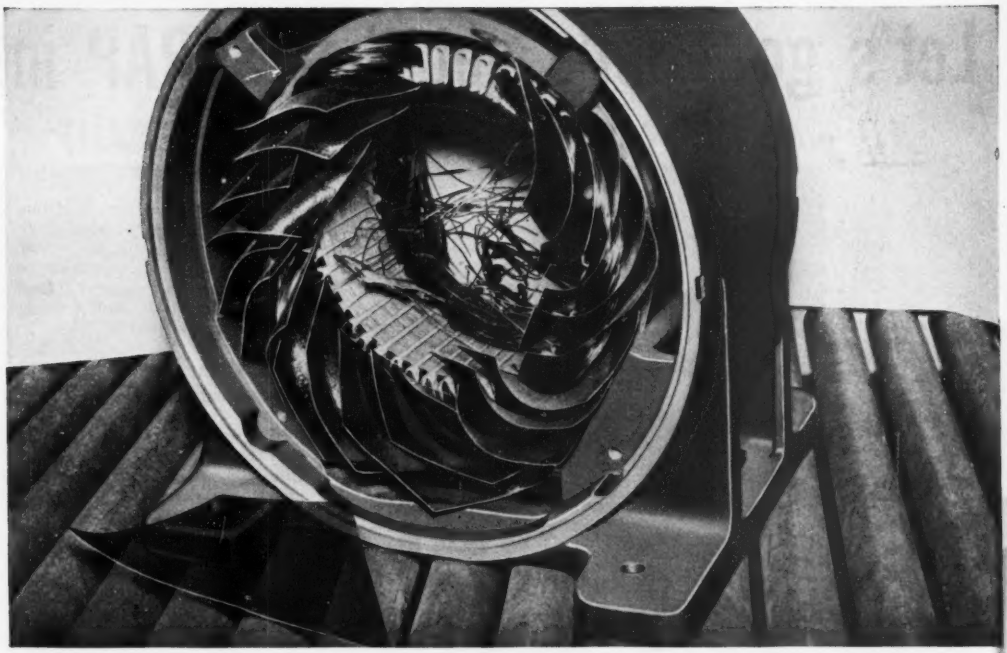
Call your nearest A-C representative or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3493

ALLIS-CHALMERS

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING

World's Widest Range of Power Plant Equipment



When insulation must stand 500° Heat ...look to IRVINGTON'S Class "H" Line

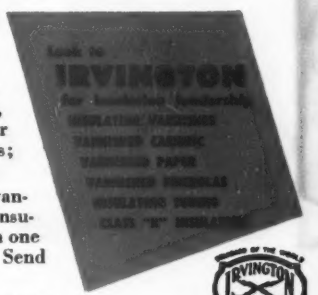
Whether you are winding for service at high ambient temperatures — for increased *continuous* power ratings — for greater *short-time* overload capacity . . .

Or *designing* for space-and-weight savings . . .

You will find the Class "H" insulation you want in the complete Irvington line.

Depending on service requirements, *your* high-temperature insulation job may call for Silicone Varnished Fiberglas*, in yard goods, tape or tubing forms; Silicone Glass Mica; Silicone Saturated or Silicone Coated Asbestos; Silicone Rubber Coated Fiberglas; Silastic**Tape, Teflon Coated Fiberglas.

We make them *all* — we're ready to help you use *each* to best advantage. Write for a free copy of our book — Irvington Class "H" Insulations — it contains samples. Perhaps you'd prefer to talk with one of our engineers. The coupon below is for your convenience. Send it today. No obligation.



*Owens-Corning Fiberglas Corp. **Dow Corning

Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

6 Argyle Terrace, Irvington 11, New Jersey

Plants: El Monte, California Hamilton, Ontario, Canada

Irvington Varnish & Insulator Co. EWO-9/51
6C Argyle Terrace, Irvington 11, N. J.

☐ Please send me a free copy of "Irvington Class 'H' Insulations".

☐ I'd like to see one of your engineers. Please have him phone or write for an appointment.

Name ..... Title .....

Company .....

Address ..... Phone .....

City ..... State .....

Let's go...let's get that SCRAP in!

All your SCRAP is urgently needed, NOW

THE scrap shortage is serious. *Your* scrap—every pound of iron and steel scrap you can locate in your plant or factory—is vitally needed and needed right away. For unless you do everything possible to get this scrap on its way to the mills, steel production is bound to slow up. That can't be allowed to happen. But without your help it surely will.

It takes at least one-half ton of scrap to make one ton of steel. With the mills turning out more than 2 million tons of steel per week, over 1400 carloads of industrial scrap are needed *every day*. And industry, somehow, must provide it.

What you can do to meet this emergency

First, organize a permanent Scrap Salvage Committee and make the "drive-for-scrap" part of your daily operations. Search out every possible source of scrap. Turn your old and worn-out equipment, tools and machinery over to your scrap dealer, at once. Dig out your discarded dies, rusted-out tanks and boilers, your old rails and other miscellaneous junk, and start them back to the mills through your scrap dealer. Encourage every employee to report every retired or obsolete machine that now stands idle—see that it is turned in for scrap.

By getting this "dormant" scrap off your premises and into the furnaces you'll be helping not only yourself but America as well. *More* scrap turned in, means *more* steel turned out—it's as simple as that. So let's get going.

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

U·S·S FORGINGS

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

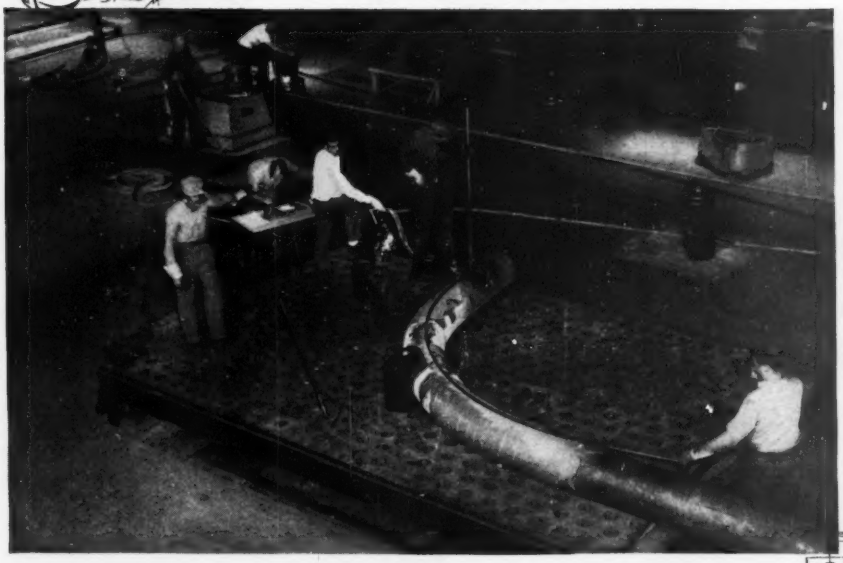
UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA. · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

T-1320

UNITED STATES STEEL

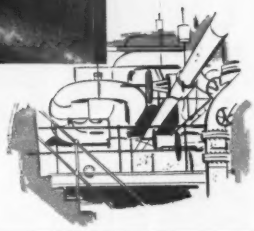
From interpretation to installation . . .



GRINNELL PREFABRICATED PIPING

assures greater customer satisfaction through its five-point program of

Quality Control



The bending operation illustrated above is an example of Grinnell QUALITY CONTROL *in action* . . .

The tubing shown is made from a chromium alloy steel forging, turned and bored. Outside diameter is 14¾ inches; wall thickness 2⅜ inches. Temperatures of the tubing within the bending furnace were maintained and controlled within 20°F of specified temperatures. Bending was done with such skill and rapidity as to permit a temperature drop of only 100°F at the inside surface of the tubing. Maximum thinning was only .06 inch.

Designed for a central station power plant to accommodate 1500 PSI and 1050°F, this is typical of Grinnell's engineering knowledge which assures prefabricated piping of the right kind — for all types of installations no matter how complex.

QUALITY CONTROL is the result of Grinnell's 100 years of practical experience in the field of piping. Delivery of prefabricated piping subassemblies to exacting engineering requirements which meet all governing code requirements is assured by Grinnell Quality Control, which includes:

- Interpretative engineering
- Metallurgical research
- Specialized facilities
- Skilled personnel
- Rigid inspection

ECONOMY of specifying Grinnell prefabricating piping results from:

- One source for design, interpretation and fabrication
- Coordination of shop production under ideal conditions
- Elimination of waste by paying only for finished material delivered
- Reduction in field erection time

Write for the booklet, Grinnell Prefabricated Piping.

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

UTILITY ENGINEERS working with General Electric's a-c network analyzer test an entire distribution system—existing or proposed—under predetermined load conditions. They study the effects of faults, plan new distribution, work out special circuits, and solve numerous other problems in a matter of hours.

WIRE AND CABLE FOR ELECTRIC UTILITIES

How soon can you take inventory for 1961?

DESIGN ENGINEERING

WORKABLE SOLUTIONS to cable problems are the important job of G-E design engineers. At General Electric, design engineers work closely with application engineers to combine performance with economy.

INSULATION RESEARCH
CONTROLLED MANUFACTURING
LABORATORY TESTING
FIELD SERVICE
INTEGRATED EXPERIENCE

The next decade is always just around the corner where utility planning is concerned—but plans on paper and actual load on the line often turn out to be two different things. That's why General Electric has installed one of the world's largest a-c network analyzers in its Schenectady plant to give utilities the opportunity to get as close as possible to real conditions before a foot of cable is installed. With G.E.'s network analyzer you can take stock of 1961's requirements now. By setting up the network analyzer to provide situations similar to yours, engineers can predict how G-E cables will function in your distribution system—can design cables that meet your requirements.

In addition, G-E engineers carry on continuous research on the effects of short circuits, high temperatures, and ionization. As a result, G-E cables offer modern insulations, practical cable construction, and economies consistent with your distribution needs.

When cable problems come up, it will pay you to call in your G-E cable representative. He can offer you the G-E engineering staff's unlimited background of test results and experience. *Section W73-927, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.*

You can put your confidence in—

GENERAL ELECTRIC

Standard of the Highway

INTERNATIONAL

TRUCKS

One million on the road

A million trucks is an impressive number of trucks. It is even more so when you consider this fact: it represents more than half of the Internationals built in the past 44 years.

What proof could be stronger testimony that International Trucks are engineered to give you lower operating and maintenance costs over a longer truck life?

See your nearest International Truck Dealer or Branch for all the facts—join the next million truck users who will have the greatest truck value on the road.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors... Motor Trucks... Industrial Power... Refrigerators and Freezers

INTERNATIONAL HARVESTER COMPANY • CHICAGO

INTERNATIONAL **TRUCKS**

"Standard of the Highway

New Arrester

Westinghouse Type LX provides 20,000 amperes ...highest short circuit capacity available today!

Here's a completely new expulsion-type arrester that brings you the kind of protection you've been looking for. Note how these features contribute to more positive protection . . . longer arrester life.

Highly current limiting—a longer arc path over a spiral course limits follow current flow through the arrester to a fraction of available fault current.

High surge discharge capacity—well over NEMA requirement of 65,000 amperes.

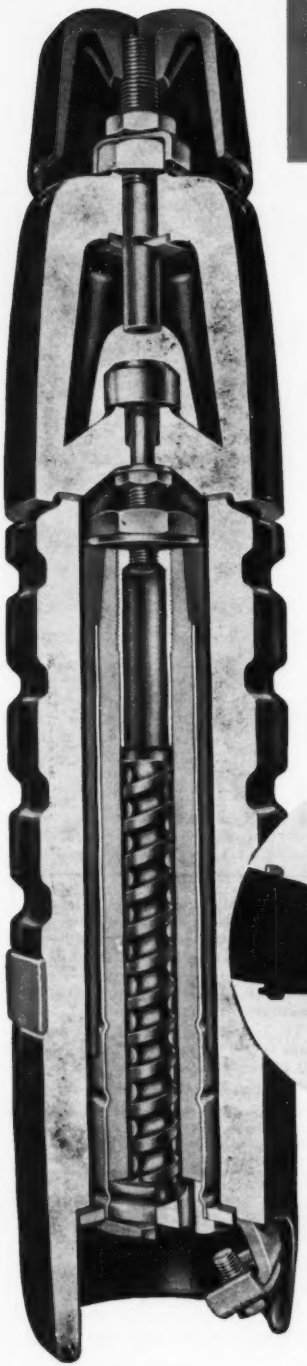
Low and consistent sparkover—skillful design has produced a gap of considerable length which sparks over at very low value.

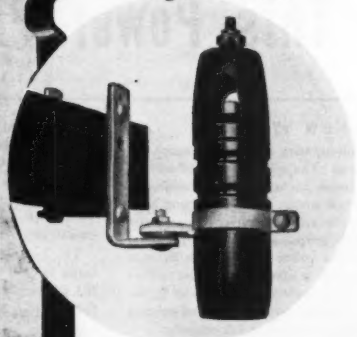
Low IR drop—since the arc drop is the only voltage that appears across the arrester during the flow of surge current, the discharge voltage is inherently low.

Operating elements totally enclosed—available with enclosed isolating gap (as shown) or with external isolating gap at bottom. With polyethylene cap (slight extra cost), fully enclosed type has no exposed metal parts at line, ground or intermediate potential. Cap pushes on; no metal springs, no turning necessary.

Easy voltage identification—each ring on main porcelain body indicates 3 kv of rating. For example, cutaway arrester pictured is 9 kv, arrester in inset is 3 kv.

Longer life—limitation of power follow current insures exceptionally long arrester life.

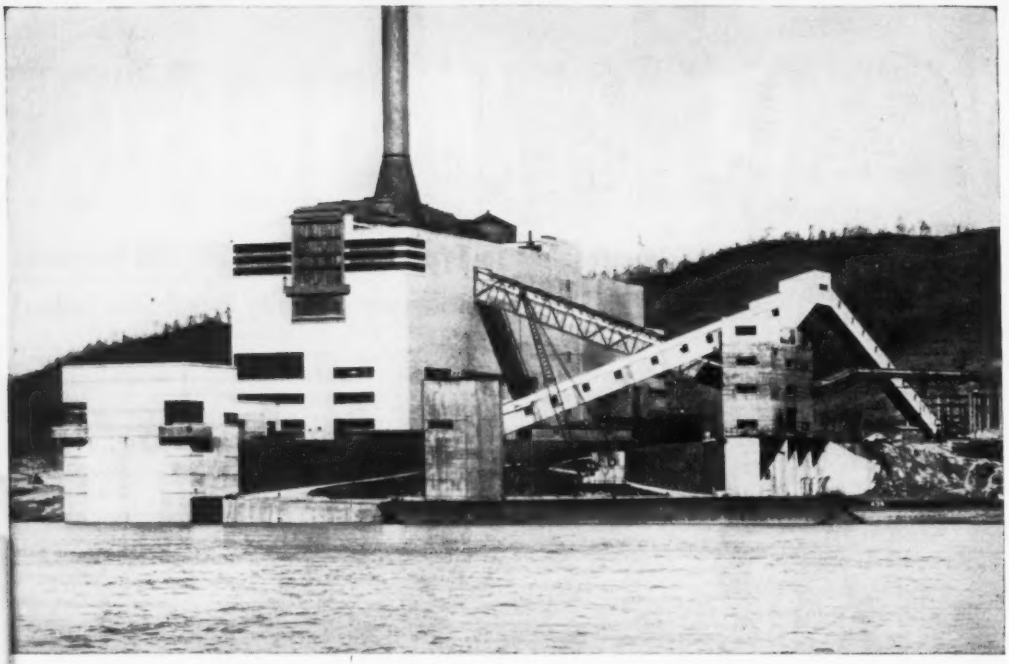




Descriptive Bulletin 38-150 explains how this revolutionary new LX design brings you these matchless benefits. Ask your Westinghouse representative for a copy or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60764

3-kv, Type-LX, "De-ion®" Expulsion Lightning Arrester with crossarm mounting bracket. This arrester has a short-circuit rating of 20,000 amperes. Ratings range from 3 to 15 kv.

YOU CAN BE SURE... IF IT'S
Westinghouse
LIGHTNING ARRESTERS



Unique Circulating Water System Installed in This Power Plant

The R. E. Burger steam-electric plant of Ohio Edison Company is located on the Ohio River well above flood stage—which may reach as much as 60 feet above extreme low water. Water is supplied to the condensers by a patented circulating water system pioneered jointly by Worthington and the consulting engineer, Mr. George W. Saathoff.

All major equipment except circulating pumps, which are designed to operate completely submerged if necessary, are located above flood stage.

The new installation of a Worthington 70,000 sq ft two-pass condenser and auxiliaries, serving a 90,000 kw turbine-generator, is the third Worthington unit in this station. Two 46,000 sq ft condensers were previously installed.

For advice on any new installation or information on a wide range of power plant equipment, consult Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, New Jersey.

HOW IT WORKS

Two full-capacity circulating pumps are used in series.* The primary pump, submerged below extreme low water, is a Worthington motor-driven HIFLO. Its high starting head characteristic is able to deliver enough water for starting purposes. A booster pump—a single-suction volute Worthington MIXFLO, mounted directly upon an hydraulic turbine—starts when there is enough water in the control well. The two pumps then operate automatically in series at full capacity.

Advantage is taken of maximum siphon effect from the condenser drop leg which enters the sealing or control well. From this well, all circulating water is passed through the hydraulic turbine. Thus the static head from sealing well to river level is utilized—75-80% being recovered—in reducing the work of the primary pump, with saving in overall pumping power.

The booster pump functions until rising water renders the turbine ineffective. Then the primary HIFLO works alone, producing full capacity under reduced head.

*In the new unit, there are two half-capacity primary pumps, permitting operation of only one in the winter when low water temperatures prevail.

Z.1.1

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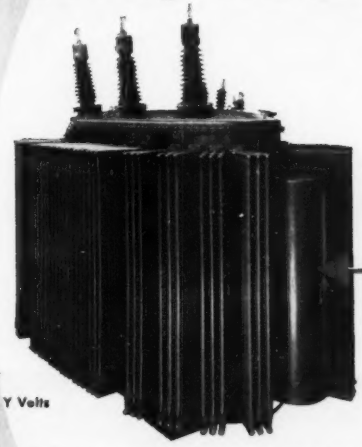
WORLD'S BROADEST LINE OF STEAM POWER PLANT AUXILIARIES

Feed Water Heaters	Boiler Feed Pumps	Steam Turbines
Steam-Jet Ejectors	Water Treating Equipment	Surface Condensers

One of these large SELF-COOLED POWER TRANSFORMERS could have been ordered by YOU...

37500 Kva,
132000/Grd. Y-
24000Y/13860 Volts



20000 Kva,
110000Δ-
34500 Grd. Y Volts

INERT GAS PRESSURE

INERT GAS-OIL SEAL

Method of OIL PRESERVATION

OIL EXPANSION TANK

25000/31250 Kva,
72000Y-13800Δ Volts

If you are a user of transformers, you probably prefer a particular method of oil preservation for your transformers.

Here are three Power Transformers that were recently manufactured by Pennsylvania Transformer Company. Of special interest is the fact that each transformer is equipped with a different method of oil preservation.

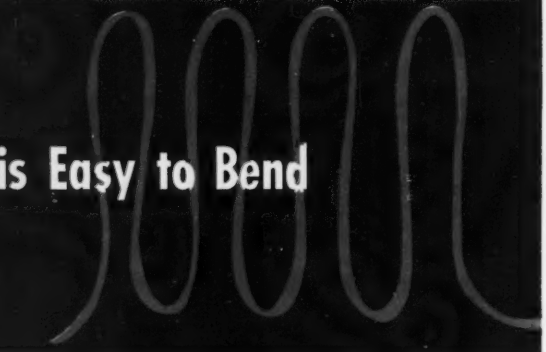
No doubt one of these methods, if not all of them, would meet with your requirements. But no matter what oil preservation method you specify, you can be certain that when it is incorporated into a Pennsylvania Transformer, it will function efficiently with the same amount of dependability as the rest of the transformer.

Pennsylvania TRANSFORMERS

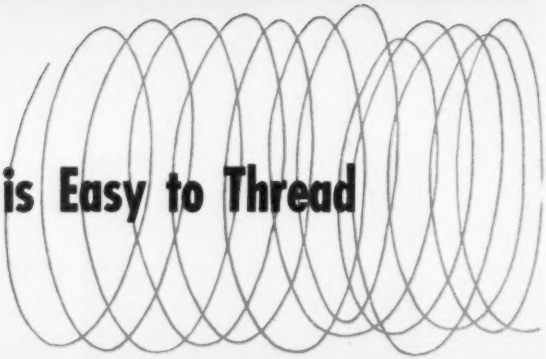
Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • *Greater Pittsburgh District*

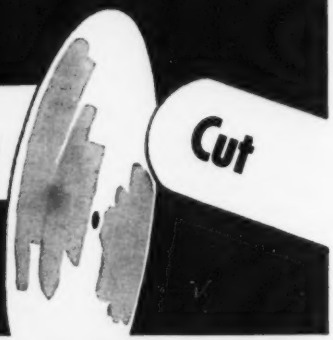
SPANG CENTRAL Conduit is Easy to Bend



SPANG CENTRAL Conduit is Easy to Thread



SPANG CENTRAL Conduit is Easy to Cut



Choose the conduit best suited to your job from the Spang-Central Big 4 Conduit family . . . "Cenlaco", hot dipped inside and out . . . "Central White", black enameled inside, electro-galvanized outside . . . "Central Black," black-enameled inside and out, and "Central EMT," lightweight, clear enamel inside, electro-galvanized outside.

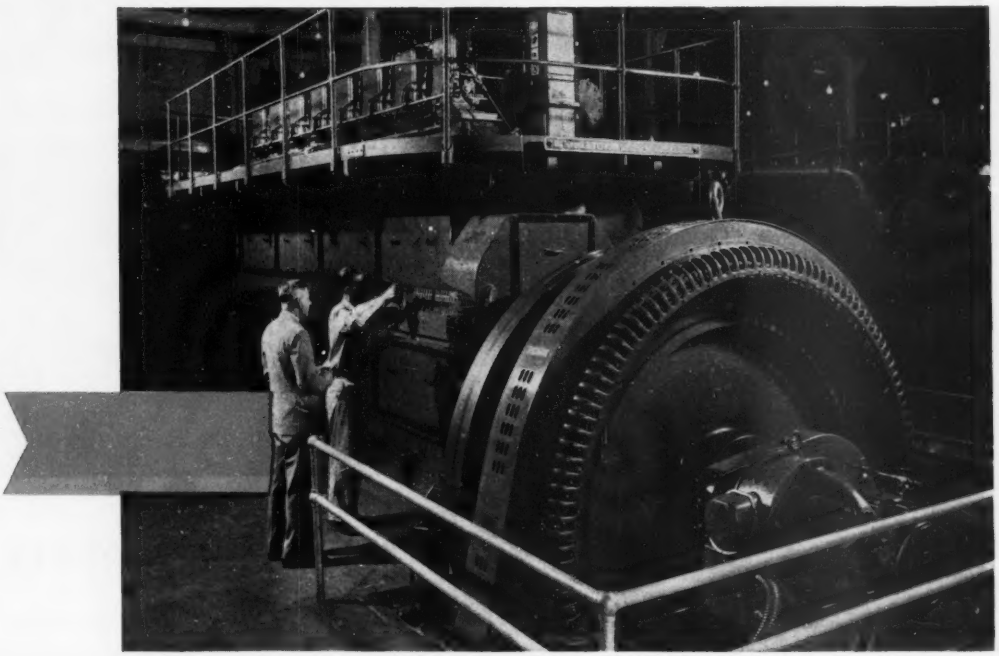
The Spang-Central Big 4 are approved by Underwriters' Laboratories and comply with the National Electric Code. Spang-Central rigid or lightweight conduit is sold through prominent, recognized distributors.

CENTRAL SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
GRANT BUILDING, PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities

Is there room for improvement in your Diesel engine lubrication?

—call in a GULF LUBRICATION ENGINEER



There's no better source of help on any problem that involves lubricants, lubrication, or maintenance of stationary Diesel engines than a trained Gulf Lubrication Engineer.

Gulf Lubrication Engineers are experts in petroleum technology—they are familiar with refining processes, additives, and the past performance records of various types of lubricants. They completely understand the effect of different operating conditions on lubricants. And, just as important, they know the lubrication requirements of all types of Diesel units and auxiliary equipment.

The application of this knowledge and experience to each individual problem helps reduce maintenance costs for power plant equipment.

To get the benefits of this expert engineering service for your plant, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
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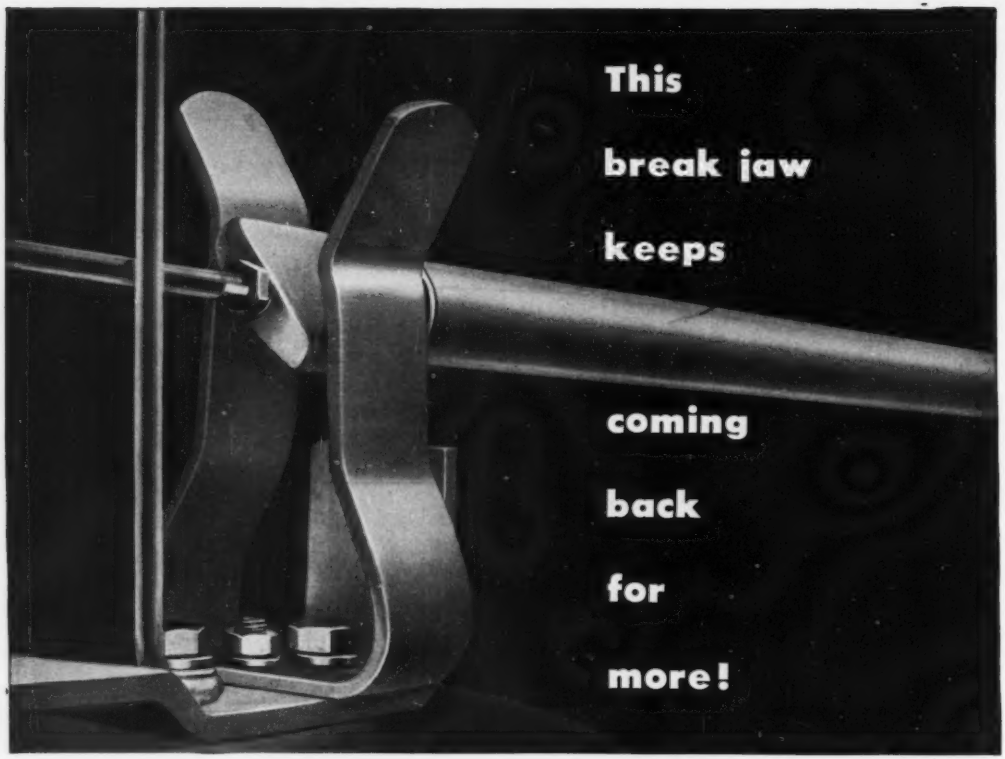

IT'S MADE OF BERYLCO BERYLLIUM COPPER

The break jaw shown here is an integral part of the Westinghouse V type disconnecting switch, designed for outdoor operation at 7½ to 230 kv, 400 to 2,000 amp. Why is it made of Berylco Beryllium Copper?

Because Westinghouse engineers wanted these qualities: good electrical conductivity; bulldog ability to grip the moving contact tightly, without relaxation, over a wide current range for long periods of time; enough "bounce" to withstand above-normal deflection without taking a permanent set.

Of all current-carrying materials, only Berylco 10 could meet these exacting demands. Furthermore, Berylco's unique combination of high conductivity and high elasticity made it possible to design the break jaw in one piece. Construction was thus simplified, efficiency of operation improved.

The unique properties of this versatile alloy —its combination of great strength, electrical conductivity and resistance to fatigue— are as vital in the products of defense as they are in peacetime products. We invite you, in your plans for the future, to take advantage of the technical knowledge of the world's largest producer of beryllium copper.

VALUABLE ENGINEERING INFORMATION on Berylco Beryllium Copper is compiled in a series of monthly technical bulletins. To receive your copy regularly, write on your business letterhead.

Sample material also available for testing purposes.

Tomorrow's products are planned today —with Berylco Beryllium Copper.

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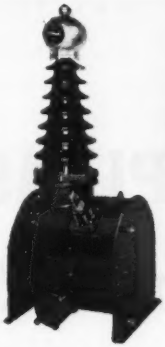
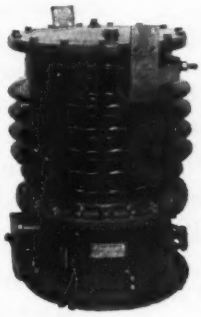
1. The type KO instrument transformer combines versatility in mounting with accuracy on heavy duty metering or relaying applications. It mounts in any position, horizontally or vertically, on poles or platforms. Tank is of all-welded construction. Transformer is vacuum-pressure compound filled to eliminate voids. Ratings: up to 15 kv — 10 to 800 amperes.



2. The newly designed type SPW potential transformer will handle accurate metering or relaying service even with the heavy operating burdens of sectionalizing switching requirements. Strength is exceptionally high. Tank is hermetically sealed. New design is very compact . . . solves the space limitation problem. Ratings: 24, 34.5, 46 and 69 kv voltage class.

3. Because the type PWD potential transformer is compound filled and the case completely welded and hermetically sealed, there is no changing or testing of liquids necessary. Transformer is free from breathing. Proper construction and design achieve high dielectric strength and high accuracy performance on all standard secondary burdens. Ratings: 240 to 14,400 primary voltage.



4. The porcelain clad type CJ outdoor oil-filled current transformer is of the wound type. It is designed for precise metering and has liberal current capacity with windings of high mechanical strength. Primary leads are brought out to blade type terminals through the porcelain bushing. Manufactured in all standard current ratings for operation on line voltages of 25 kv through 69 kv.

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AMONG THE MORE than 400 ratings of Allis-Chalmers instrument transformers, there's one that will fit your design needs. That's why you can save time and money, too, by standardizing on A-C instrument transformers. In every type you'll find the right combination of the best in engineering and materials. Whether your need is for instrument transformers or metering outfits you will profit three ways when you call on the Allis-Chalmers source of supply. You get (1) top quality, (2) prompt shipment and (3) wide selection.

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Please send new 32 page bulletin 61B7168 listing types, ratings, applications and prices of Allis-Chalmers instrument transformers.

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ALLIS-CHALMERS

PIONEERS IN POWER AND ELECTRICAL EQUIPMENT FROM GENERATION THROUGH UTILIZATION

Not, PLEASE, In the Name of Fairness

Our national Office of Economic Stabilization has adopted a policy of gearing wages to the cost of living. We are told that "escalator clauses," which provide that rates of pay shall be adjusted to take account of changes in the cost of living, will be generally approved.

If the adoption of this policy had been announced as a frank concession to political expediency, it would have been quite understandable. There may very well be votes, lots of them, in a policy which purports to protect the income of a large group against loss through the price inflation caused by the defense program.

A case might even have been made for a policy of approving escalator clauses on grounds of production expediency. The leaders of some three million organized workers now covered by such clauses have indicated that they would fight to the limit to keep them and thus maintain "real wages," that is, wages measured by their purchasing power. The leaders of other organized groups have indicated they would fight to get the benefit of such clauses. Denial of them might mean serious strikes.

Justified "in Fairness"

However, the policy of approving escalator clauses was not based on these relatively low grounds of expediency. It was justified on high moral grounds, on grounds of "fairness." In the words of the President's Council of Economic Advisers, "maintenance of real wages during inflation cannot in fairness be disallowed."

That proposition is false.

It would be truthful to say, "maintenance of real wages during inflation cannot in fairness be allowed."

The truth of the corrected proposition becomes evident immediately when you take a look at the basic nature of the inflationary problem created by defense mobilization.

We are devoting a large share of our national production to defense. The share is now scheduled to hit about 20% in 1952.

Since we are not able to increase our total production fast enough to meet defense needs

in addition to civilian needs, that means a cut in the supply of goods and services that is available for civilian consumption. But the money paid out for the production of defense materials is added to that which is available to buy civilian goods.

Thus, more money is put into the hands of the people to buy less goods. So prices go up. That is inflation.

If one group of people then is granted enough additional money to offset the price increases — and that is the purpose of an escalator clause — and thus can continue to buy as much as they have been buying right along, less goods will be left for other consumers who are not getting this advantage. That is palpably an unfair distribution of the sacrifices necessitated by defense mobilization. In fairness, therefore, maintenance of real wages in inflation cannot be allowed.

Organized workers were not the first, of course, to get the benefit of an automatic adjustment to take account of the increased cost of living. The farmers got theirs first. The price parity formula is, in essence, an escalator clause. The federal government underwrites increases in the prices of the things farmers sell in order to match increases in the prices of the things they buy.

Crucifying the Helpless

As matters stand, two groups are without benefit of escalator clauses. One group is composed of manufacturing firms. While they have not been nearly as successful as the misleading reports of "record-breaking profits" suggest, they have been able to look after themselves fairly well — thus far.

But one group is completely without protection. It is that numerically large but politically unorganized mass of people — many of them old and relatively helpless — who are trying to live on pensions, annuities and other fixed incomes derived from their savings. They are at the end of the line when the increased costs of inflation are passed along. They have no one to whom they can pass the buck. They are being progressively pauperized by the continuing inflation caused by progressive boosting of costs and hence prices.

With the present line-up of pressure groups in Washington, protection for the principal victims of inflation — those who have saved for a rainy day only to find inflation has blown away the roof — is obviously an extremely difficult business. But to have even temporary insulation against inflation granted to powerful groups in the name of fairness should be offensive to the nostrils of a nation that presumes to assert the moral leadership of the Western World.

The only really fair way to handle inflation is to prevent it. But once it is under way, fairness demands that the burdens be as evenly distributed as practicable.

An escalator clause — or a farm parity provision — is explicitly a device to enable the group favored by it to escape the burden of inflation. Whatever concessions we feel we must make to political pressures or production expediency, let us at least be honest enough not to invoke "fairness" as justification for so arbitrary a discrimination in the distribution of the defense burden.

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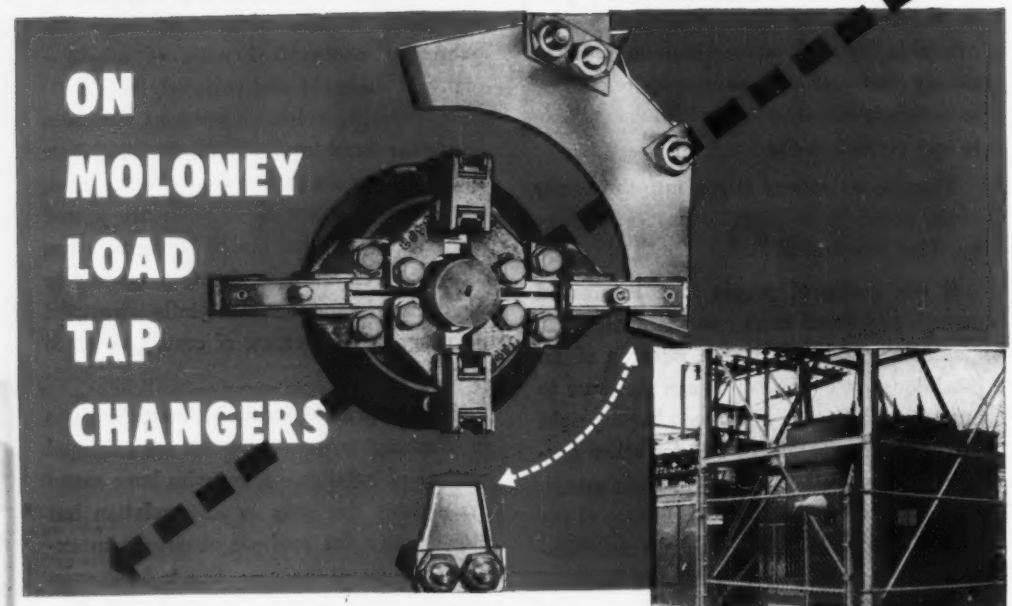
GREATER ARC CLEARANCE...



Provided on . . . Moloney Feeder Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers

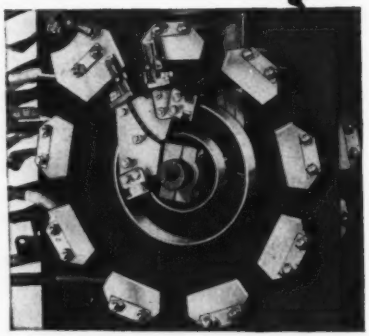
Load Tap Changers, provided on all Moloney Feeder Voltage Regulators, Regulating Transformers and Load Ratio Control Transformers, feature a Load Transfer Switch which relieves the Tap Selector Switch of all arcing duties and results in greatly increased arc interrupting capacity.

Use of the separate Load Transfer Switch permits longer arc clearances to be maintained since arcing duty is confined to but two stationary contacts per phase. This is in contrast to the nine stationary contacts per phase which are subject to arcing on regulators which require the Tap Selector Switch to break the load current.

This feature of the Moloney Load Tap Changer, along with the use of by-pass switching reactors, permits tap changing on a larger Kva load without increasing the physical size of the Load Tap Changing equipment. Maintenance costs are also reduced since arcing is eliminated from the Tap Selector Switch.

MEB1-1A

NO ARCING HERE...



No arcing duty is imposed upon any of the tap selector switch contacts, avoiding the necessity for replacement due to burning or scoring. Contacts are of hardened *copper alloy* to minimize frictional wear.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

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Editorials

Principles and Team Play

(Extracts from an address by George M. Gadsby, president of Edison Electric Institute, to the Pennsylvania Electric Association, Sept. 18, at Philadelphia)

"Now the position of the private electric industry is one which will stand up under the most critical public scrutiny.

"We stand foursquare for the preservation and strengthening of the American system of equal opportunity for all. We believe that the American free enterprise system can provide more benefits for more people than any alternative system, existing or proposed.

"We acknowledge and accept our four-fold duty:

"First, to furnish to the people of America an efficient and reliable electricity supply, at lowest self-sustaining cost, adequate for their homes, their farms, their work, their industry, and their enjoyment.

"Second, to maintain attractive, safe, working conditions, at good wages for our employees.

"Third, to earn a fair return for the investors whose funds have made possible the development of the excellent electrical systems of this country.

"Fourth, and above all, to strive for the security of our nation.

"We will accomplish little, however, by a statement of principles alone or by any local actions taken as separate companies. What we do and say must be backed by sincerity and full performance, and the saying of it must be forceful, continuous, and efficacious on a broad scale.

"After years of trial and error, our industrial activities have fallen into four major and complementary organizations:

"1. Through the Edison Electric Institute we gather volumes of pertinent information and cover the field of technical and statistical functions.

"2. We must know about the constantly changing Washington scene with all of its ramifications of authorizations, appropriations, taxation, and policy determinations directly affecting our companies. This function is performed by the National Association of Electric Companies.

"3. We also have an objective function in presenting the electricity story and reporting on the discharge of our obligations to the public. On a national scale this job of keeping the public informed is that of the Electric Companies' Advertising Program.

"4. The actual plowing, seeding, watering, and harvesting must be done by each company in its own service area and assisting in this all important field we have the Public Information Program.

"5. In addition to these four there is the Association of Edison Illuminating Companies. Its activities over the years have been principally those of research and the gathering of statistics.

"6. One more addition to the above industry-wide organizations should be made, and that is our great friend and able servant, Reddy Kilowatt. Reddy has become known throughout the nation as the visual embodiment of electric service by the investor-owned electric companies.

"Over half of the country's 305 Class A and B companies belong to EEI but these do 83% of the business of the investor-owned companies; about one-third belong to NAEC; 37% support the Electric Companies' Advertising Program; and 20% the Public Information Program, this being the most recent organization. The combined annual budget of these four major agencies is approximately $3 million, of which one-half is used for the radio and magazine advertising of ECAP. This total amounts to 6/100's of 1% of the combined electric revenues and for a company which supports all four, the cost is about 12/100's of 1%. I shall not comment on these figures as I think they tell their own meager story.

"The 1951 pattern of Responsibilities, Opportunities, and Difficulties can be accepted with assurance. The responsibilities will be met; the opportunities in large measure grow out of the difficulties. One of the fine things is the opportunity to pull the men of our great industry into formation of more solidarity. Functionally we are closing ranks, welding our industry organization activities into coordinated team play. We need the support, the advice, the intelligence, and planned labors of every investor-owned company in the land."

Engineers or No Freedom

A critical shortage of manpower will be with us for the next three years, according to the Census Bureau. The Defense Department alone estimates that its requirements for the draft will fall short by about 500,000 men during this period. And the situation will not improve very much until after 1955.

Under these conditions the supply of young engineers for industry can dwindle alarmingly unless the public and the government are made aware of the important and indispensable role engineers have in maintaining a free world. As such, present engineers and young men about to enter engineering colleges should be given equal consideration with the needs of the military.

A program for informing the public will be presented by the Engineering Manpower Commission of the Engineers Joint Council at a manpower convocation in Pittsburgh on Friday, Sept. 28, in cooperation with the Engineering Society of Western Pennsylvania and the Guidance Committee of the Engineers Council for Professional Development. Educators from secondary schools and colleges, members of industry and the engineering profession, as well as engineers from throughout the United States, will attend.

In seconding this action by EJC, Electrical World cannot recommend too strongly that industry give its full support to a program which can mean the difference between continued technical advancement in a free world and no freedom at all.

Steam from Reactors

News released about atomic-powered submarines and airplanes gives encouragement about the earlier prospect of utility power plants similarly founded on nuclear reactors. For security reasons little is disclosed about the cycles to be employed nor even what the working fluids are to be. Nowhere along the path of discussion of atomic power has it been established whether the reactors can safely be worked and controlled at temperatures that will result in steam at temperatures and pressures that are representative of today's electric system power plants—say 1,200-2,000 psi and 900-1,100 F.

Thus the imminence of atomic power is quite conjectural at the present stage whether or not it is accelerated by the military commitments—behind which it can be assumed there is now far more assurance than supported the launching of the huge Oak Ridge project a decade ago. Putting it in other terms, even if it proves feasible and practicable to derive firm and dependable power from nuclear reaction, will it be at thermodynamic levels that typify today's thermal efficiencies or must it compete economically by carrying the disadvantage of the lower, less efficient levels? Facts on these points will clarify the situation as fast as they are disclosed authoritatively.

Meanwhile one wee sidelight does offer means of stretching a bit beyond the steam temperature derivable from the pile itself. The scientists say that there is a modest degree of dissociation of water into hydrogen and oxygen in the influence of the nuclear radiation. Thus once the steam has been raised as far in pressure and temperature as the reactor (other intermediate transfer medium) can produce, the temperature can be elevated by applying the heat derivable from combustion of the released and captured hydrogen and oxygen. Of course, the system will have to employ metals that will not be destroyed by the viciousness of the nascent gases.

No Great Boons from the Atom

"The golden abundance of an Atomic Age" is an illusion. This is the considered opinion of one of the great minds of our time, that of James Bryant Conant, president of Harvard. He expressed it at the recent annual convention of the American Chemical Society in New York. Instead of enjoying any great boons and blessings from atomic fission, he saw a worried humanity trying to escape the terrors of it.

So far the great preponderance of evidence points to validity for his conclusion. As yet, atom splitting has given the world much more of horror and fear than of benefit. Perhaps that is why apprehensive mankind has looked so hopefully—in unconsciously desperate hopefulness—toward a wonderful good to come from a thing whose first works have been mostly evil. That is the way man's mind operates. No matter how desperate conditions may be, mankind always has the hope that conditions will turn out for the better.

Apart from these philosophical considerations, and in a more cheerful vein, Dr. Conant's statements should be welcomed, particularly by electric utility folks. It should relieve them somewhat from the pressure of rather general belief that the magic of the atom will pretty soon supply electricity for free and from the consequent implication that meantime the utilities are charging as much as they dare in order to get as much money as possible while they can.

System Efficiency Improving

Assume a system with 50% load-variation factor and 85% utilization factor. It has 15% reserve and this should be maintained. Adding enough capacity each year to meet 8% growth and hold 15% margin will, after five years, result in practically 70% of the base load being carried or at least carryable by units less than five years old. These substitutions of higher-efficiency, modern generation are a consoling item among the worries of managements conscious of the gnawings of inflation.

The 0.8 to 1.0 lb of coal per kwhr of which these new units are capable can make a big dent in the overall coal bill. An analysis might well show the desirability of extending the substitution beyond the mere growth requirements—if, as, and when there is any break in the dark clouds of restrictions on new equipment and installations.

The Electrical Week

INDUSTRY MOBILIZATION (Pages 78 and 79)—Salary Stabilization Board thaws freeze a bit, permits raises for service and merit . . . Depa clarifies recent regulations for obtaining controlled materials . . . Electric equipment manufacturers contend CMP ratings are falling short of NPA promises . . . NPA reclassification of "A" and "B" products and controlled materials will affect allotments to utilities . . . Electrical equipment manufacturers protest to NPA, get more metals . . . Industry M orders are listed on Page 79.

WASHINGTON—Depa orders utilities in Northwest to conserve power for defense needs (p 72) . . . Sen Henry Dworshak of Idaho is trying to revive work on Palisades Hydroelectric Project (p 73) . . . Richard L. Boke has quit his Reclamation post to accept a State Department job in Iraq (p 73) . . . Hoover Commission proposals to reorganize Rural Electrification Administration hit snag at Senate hearing (p 75).

ELSEWHERE—Gaylord Penney and Clifford Foust to receive Franklin Institute medals (p 74) . . . Opposition to Schafer resuscitation method is outlined at EEI Accident Prevention Committee meeting (p75) . . . Top utility management must mold public opinion to keep industry from being nationalized, Rocky Mountain Electric League is told (p 76) . . . Standardization and substitution urged by National Production Authority to save critical materials (p 150).

• • •

Latest from Washington—Use of a CMP symbol similar to the one now being used for defense and atomic energy projects has been suggested for vital electric power projects by Depa's Materials and Equipment Division Director Thomas E. Marburger . . . Top mobilizers say that industrial and defense demands for power account for just a little over half the proposed capacity increases . . . More directives are being used to speed delivery of equipment for top-priority generating plants . . . Interior Department will be allowed to build a wind-driven generator if a bill now being considered becomes law . . . REA looks forward to time when co-ops will be building completely standardized steam plants . . . Interior has promoted and given silver medals to seven of its engineers and aides who penetrated Alaskan wilderness to map possible hydroelectric plant sites . . . At Interior's request DPA has held up $46-million emergency defense loan to Harvey Machinery Co., Kalispell, Mont., to build alumina facilities. Reason: The power shortage in the Northwest.

Middle South Utilities, Inc., is carrying on preliminary discussions with Arkansas-Missouri Power Co which may lead to its purchase of Ark-Mo.

Baxter International Economic Research Bureau, 68 William St., N. Y. C., said in its Bulletin 34: "Utility Industry Faces a Long Bear Market" because of (1) over-expansion, (2) large debt increase, (3) higher taxes, (4) more government competition, and (5) saturation of electrical appliances.

Latest from Midwest—REA co-ops may contract for power from new Army Engineers plant at the Rapids, Sault Ste. Marie, Mich., thereby becoming competitor of Edison Sault Electric Co . . . Wisconsin Public Service Corp plans to increase its distribution research . . . North American Coal Co makes 151-year contract with Ohio Edison for about 750,000 tons of coal a year. Coal would go to Burger Plant.

CIO Utility Workers Union will hold fifth convention Sept. 28-30 at Cleveland . . . At National Farm Electrification Conference, Oct. 9-10 at Gibson Hotel, Cincinnati, key speakers will be Pres. G. M. Gadsby, EEI and Utah P&L, and Claude R. Wickard, REA boss.

Campaign to remove from house sockets obsolete bulbs which cause TV interference is being pushed by General Electric. St. Joseph L&P pioneered idea by replacing 200 such lamps free of charge . . . Westinghouse Electric will spend $8 million (most in history) in three-month appliance advertising campaign this fall . . . Because of materials shortages, GE is stopping all production of roasters and waffle irons.

Pennsylvania Electric Association Meeting — Power companies have 3 million stockholders, 1 for every 12 home customers. "Our companies are publicly owned in the broadest sense of the word," said H. B. Bryans, Philadelphia Electric president . . . E. W. Oesterreich, Duquesne Light, whose pole-top resuscitation method has saved 101 lives, got wrist watch, his wife a silver platter for encouraging him . . . R. A. Gallagher, Pennsylvania Electric VP, elected PEA president.

Congratulations—Detroit Edison elects Walker L. Cisler, executive vice president, a director. He will become president on Dec. 1 when James W. Parker retires . . . Northern States Power of Wisconsin appoints Stuart V. Willson to newly created post of executive vice president . . . California Electric Power names VP Fred Oldendorf, Jr, assistant general manager.

Depa Orders Northwest Companies to Save Power for Defense Demand

With a keen eye on vital defense needs, Defense Electric Power Administration has sounded an alert for electric power conservation in the Pacific Northwest.

The signal came last week in an order imposing immediate duties on electric utilities in the area. It also detailed an orderly curtailment of power usage should this be needed.

Drought Conditions Responsible

Drought conditions causing a sharp drop in the water flow of the Columbia River system made the order necessary. Areas covered include Washington, portions of Northern and Western Oregon, Northern Idaho, and Western Montana.

Utilities serving the area were ordered to supply demands of atomic energy installations as well as the Spokane Magnesium Co plant and the Pennsylvania Salt Co. Only the magnesium company was limited to a specified amount—42,000-kw demand and associated energy.

Other provisions of the order:

1. Forbid utilities to take any plant in the designated area out of service for routine maintenance or overhaul while its capacity is needed.

2. Require Depa authorization to abandon any generating facility.

3. Require non-utility power producers to operate facilities and interchange energy through interconnections so as to achieve maximum power supply, provided such interchange is consistent with present agreements.

Full Operation, Exchange

4. Require utilities to operate all facilities and exchange power with other utilities with an eye toward achieving the maximum coordination of power supply.

5. Require utilities to report any non-utility in their service area which is not cooperating with provisions of the order.

6. Require each utility in the area to keep affected customers informed of provisions of this order and subsequent orders.

7. Require utilities in the area to notify consumers of base-period (July 1, 1950, to June 30, 1951) consumption and of weekly energy base as well as other facts needed to establish a basis for orderly curtailment of use when needed.

8. Require utilities to keep figures and file reports to Depa on power usage by large users.

The order also sets up what Depa believes to be an orderly curtailment of electric power usage in the designated area. Curtailment provisions, however, are inoperative until Depa issues a supplement to the order. Such supplement could come by the early part of October if it doesn't rain.

These provisions in the order listed:

1. Limitations on increases of deliveries of electric energy. This would bring into play the base-period information, limiting use to set quotas.

2. Prohibition of designated non-essential uses of electric energy. This is the so-called "brownout" provision, which would forbid use of electricity for signs, show windows, sports field lighting, and similar uses.

3. Quota limitations on consumption and deliveries of electric energy. Based on base-period use and other information, percentage quotas would be set up for energy use by larger consumers.

4. Reduction of deliveries to consumers with electric generating facilities. This is designed to encourage full use of all industrial generating facilities.

5. Voluntary reductions in consumption of electric power by domestic users.

Administration of the order was put in the hands of Johann M. Gumz, chief of Depa's Utilization and Conservation Branch. Gumz is on leave from Pacific Gas & Electric Co. He will consult with a three-man advisory committee to be made up of a member each from privately owned, non-federal publicly owned, and federal electric utilities.

Unless revoked earlier, the order will terminate March 31 of next year.

Southeast Next?

Number 2 critical area, as far as electric power is concerned, is the Southeast. Tennessee Valley Authority, which serves part of the area, reported troubles this week. Water levels in reservoirs are lower than last year, and the load is substantially larger. All steam plants on the system are already in operation.

BPA Cuts Off 245,000 Kw of Interruptible Power

Bonneville Power Administration, Sept. 18, cut off 245,000 kw of interruptible power to seven major electroprocess companies. Included were four aluminum reduction plants which depend on interruptible power for about 24% of their needs. And those four, according to June production figures, produce about 50% of the nation's total.

The cutback included most of the interruptible load of the Bonneville system as of the curtailment date. The aluminum companies were taking about 185,000 kw of the 245,000 kw.

The seven companies affected were Aluminum Co of America, Kaiser Aluminum & Chemical Co, Reynolds Metals Co, Union Carbide & Carbon Corp, Pacific Carbide & Alloys Co, Keokuk Electro-Metals Co, and Victor Chemical Works.

D. L. Marlett, acting Bonneville administrator, said that the order could be modified in the interests of defense production if Depa would order a general curtailment in power use.

Tacoma Will Continue Cowlitz Fight Oct. 31

The City of Tacoma, Wash., will continue its fight for a Federal Power Commission license to build the Cowlitz project when oral arguments are presented before the commission Oct. 31.

An FPC examiner recommended that no license be granted because the project would interfere with the fishing resources of the Cowlitz River. Oral argument was scheduled after exceptions to the recommendation were filed by the City of Tacoma, the attorney general of Washington, the Washington State Sportsmen's Council Inc, the Washington State Departments of Fisheries and Game, and the FPC staff.

ATOMIC ENERGY COMMISSION will eventually draw more than 600,000 kw for its plant at Paducah, Ky., from this steam plant being built at Shawnee on the south side of the Ohio River by Tennessee Valley Authority. AEC will also draw a like amount from the Joppa plant of Electric Energy, Inc, going up on the north side of the river (EW, Aug. 20, p 11)

Hanford Works Contract Extended by GE and AEC

General Electric Co and the Atomic Energy Commission have agreed on a five-year extension of its contract for operation of Hanford Works and the nearby government-owned town of Richland, Wash. The company will continue to get its original fee of $1, but the contract extension provides for renegotiation at some point in the future if either party deems it desirable.

All costs incurred by GE in carrying out its contract are reimbursed from government funds. The original contract called for provisional advance by the government to the company of $200,000 a month for reimbursement of administrative costs. Since actual administrative costs have been appreciably less than this amount, substantial refunds are being made to the government covering past years. Extension of the contract provides for cutting monthly advances to $100,000.

The excess of other reserve funds which GE has not found it necessary to use have been refunded, making the total of all refunds about $10 million.

In the future, AEC will award construction contracts itself, rather than through GE. The company, however, will continue to furnish architect-engineer-management and other related construction services, such as preliminary studies and surveys, procurement, design and construction supervising, and warehousing.

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Senator Tries to Revive Palisades Hydro Project

A drive to revive work on the $76 million Palisades Hydroelectric Project in Southeastern Idaho is being headed by Republican Sen Henry C. Dworshak of that state.

The Bureau of the Budget dropped the project from its 1952 money requests on the theory it was a new project, not desperately needed for defense. Congressional appropriation committees left it out of the funds bill because it had not been included in budget requests.

Some $3 million has been spent in preliminary work on Palisades, and Dworshak said he believes its power features are needed to meet demands in the area. He is now asking the bureau to submit a request for funds for the project. The bureau has not taken action on the request.

To support his argument that more power is needed in the area, the Idaho Senator has submitted a report by Federal Power Commission indicating that estimated load will be 148,000 kw greater than dependable capacity by late 1956.

The first three units of the project would furnish only 135,000 kw. A fourth and fifth unit would add another 112,500 kw.

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Boke Quits USBR Post; Accepts State Dept. Job

Richard L. Boke has resigned as regional director of the U. S. Bureau of Reclamation's Sacramento office to accept a State Department job in Iraq.

Boke will be director of technical cooperation in this government's efforts to aid Iraq in developing the natural resources of that country. His headquarters will be in Baghdad.

R. S. Calland, an engineer, is serving as acting director of the region pending appointment of Boke's successor.

GAYLORD W. PENNEY

CLIFFORD M. FOUST

Gaylord Penney and Clifford Foust to Receive Franklin Institute Medals

Gaylord Wallis Penney, holder of the George Westinghouse Professorship of Engineering at Carnegie Institute of Technology, has been named recipient of a John Price Wetherill Medal by The Franklin Institute, Philadelphia, Pa.

The award was made for Penney's work in the development of a practical and commercially used electronic precipitator to combat dust particles contaminating the air in industrial communities.

The institute also announced it has awarded a Howard N. Potts Medal to Clifford M. Foust, General Electric Co. The award was made "in recognition of his many contributions to the knowledge of high-voltage surge phenomena and the quantitative measurements furthering this knowledge through his development of accurate measuring devices."

From 1923 to 1947, Penney worked with Westinghouse Electric Co, Pittsburgh, where he developed his electrostatic precipitator. First he served as a research engineer and later as manager of the electro-physics department. During World War II he also served with the Atomic Energy Commission, Office of Scientific Research and Development, and the U. S. Army. In 1947 he became the George Westinghouse professor at Carnegie.

The Wetherill Medal was established in 1925 and is given for discovery or invention in the physical sciences.

Following his graduation from Carnegie Institute, Foust became engineering assistant to Dr. Charles P. Steinmetz with GE in Schenectady. In 1928 he was appointed section engineer in charge of high voltage and surge measurements and in 1945 became division engineer of the High Voltage and Nucleonics Division. In 1935, Foust received the Charles A. Coffin Award, highest honor bestowed by the company on its employees. He is a fellow of the American Institute of Electrical Engineers.

The Potts Medal is given for distinguished work in science or the arts. Both presentations will be made Oct. 17 at ceremonies at the institute.

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Power Shortage Hobbles Europe's Expansion Plans

Lack of critical materials is blamed for the tight electric power supply in Western Europe.

Economic Cooperation Administration estimates the area has a deficiency of about 5.5 million kw, and will not be able to catch up before 1954. Even that would call for a speed-up in the present expansion program, ECA said.

Lack of electric power, coupled with shortage of coal and steel, is holding back the general industrial expansion. Besides increased output, ECA believes Western Europeans will have to find more efficient means of using what electricity is available.

Divert Lewis River to Aid Yale Dam Construction

Working three shifts daily, hard rock miners have completed a 1,500-ft-long 30-ft diameter horseshoe-shaped bore around the site of Yale Dam, under construction by Pacific Power & Light Co in southwestern Washington. The tunnel will divert the Lewis River while the dam is constructed.

The river will be turned through the tunnel by mid-September, permitting workmen to start scooping out the base of the stream to bed rock preparatory to actual construction on the $26.5 million dam, scheduled for completion in November, 1952.

Yale Dam, located immediately upstream from Pacific Power & Light's Merwin Dam, near Woodland, Wash., will have a capacity of 100,000 kw. Operated in tamdem with the Merwin Dam, the project will produce about 550 million kwhr of electric energy a year.

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Seattle City Light Battles Unions on Wage Demands

Seattle City Light and labor unions have failed to agree on wages to be paid to 21 crafts employed by the municipal utility, although agreement has been reached on other demands.

The city council objects to paying City Light workmen higher wages than are paid to similar workmen in other city departments, especially since the utility's employees enjoy paid holidays, vacations, and other benefits that are not granted in private industry. The union, however, contends that wages of City Light, which was taken over from private enterprise, should not be determined by the wages of tax-supported city departments.

The unions, representing workmen and office workers, have made wage demands calling for a 15% increase.

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Conducts Plant Survey

The Saskatchewan Power Corp, Regina, Sask., is conducting an investigation of prospective power demand in the Lone Rock area to determine the possibility of establishing a power plant. The plant, if constructed, would use natural gas as its fuel.

Opposition to Resuscitation Method Outlined to EEI Accident Committee

Strong aversion of allied navies after World War II to the Schafer resuscitation method has been amplified by a similar attitude of all U. S. military agencies, the Red Cross, and other welfare bodies.

This feeling was brought out at a recent conference under American Red Cross auspices and was discussed at a meeting of Edison Electric Institute's Accident Prevention Committee in New York, Sept. 13-14.

Aversion to Method Explained

Wills Maclachlen (Maple, Ont.), sponsored an EEI symposium at which Dr Cecil K. Drinker, Consolidated Edison Co consultant, explained the aversion as resting on the absence in the long-accepted Schafer method of any physical factor other than physiological elasticity for putting air into the lungs after the forced expulsion. Drinker warned, however, that the Schafer method is not to be glibly supplanted overnight by some alternative substantiated only by laboratory studies. Those present were disturbed by the prospect of abandoning a technique which had had more than 30 years of inculcation among utilities, schools, and the like.

The committee unanimously approved a resolution asserting that electric utilities, after several decades of successful use of the Schafer and Osterreich methods of resuscitation, we are reluctant to change until it was shown in field results that alternative methods would save more lives.

CEI Tests Method

Cleveland Electric Illuminating Co has had favorable reaction to trials of a so-called hip-roll, rib-pressure procedure, H. J. Crisick, CEI, said. The method has been submitted to 80% of the employees.

Utility management according to W. T. Rogers, Ebasco, is being awakened to its comparatively poor accident prevention record relative to other U. S. industries. More emphasis is to be placed on awards and rewards so that the 920 lives preventably lost in the last decade will be saved in the next. Meanwhile the 1951 record compiled and projected by Crisick promises to be from 8 to 18% better than 1950 as to performance index, severity, and fatalities.

In 1950 the 141 fatal accidents compiled in detail by D. C. Stewart, Niagara Mohawk Power Co., included 102 (72%) from electric shock and burns, 14 from falls, and 9 from vehicular accidents. Hand contacts (no rubber gloves) are still the primary factor.

Lack of uniformity in basing utility accident reports and even in interpreting the American Standards Association code may account for some of the differences between companies and industries reporting to NSC, according to S. H. Young, Hartford. His committee was authorized to clarify the discrepancies.

J. C. Falkner, Consolidated Edison's manager of electric production, said that in case of bombing, plant operators will stay at their posts; others will retire to designated shelters.

Arkansas Utilities Appeal Decision on Co-op Plant

Four private utilities, joined by the International Brotherhood of Electrical Workers, AFL, have appealed the decision of Arkansas Public Service Commission to permit a rural cooperative to build a 30,000-kw steam plant at Ozark (EW, Aug. 20, p 13).

After the longest hearing in its history, the PSC on Aug. 11 granted Arkansas Electric Cooperative a permit for the plant and transmission system, to cost $10.5 million. The utilities contended the system would duplicate existing lines. They have filed an appeal in county court asking that the decision be set aside.

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New BPA Headquarters

Construction will begin within a few months on Bonneville Power Administration's new headquarters in Portland, Ore., which will be completed at the end of 1952. National Production Authority has given its approval of the $3,250,000 project.

Proposals for REA Reorganization Meet Opposition from Senate Group

Proposals to reorganize the Rural Electrification Administration along lines recommended by the Hoover Commission ran into opposition at a recent hearing of the Senate Committee on Expenditures in Executive Departments.

Committee Chairman John L. McClellan, Arkansas Democrat, told one witness, "I know from expressions from members of the committee we certainly do not want to do anything with REA that would, in any way, handicap it in carrying out its functions."

The bill, which includes the proposals for streamlining REA, calls for changing the name to Rural Electrification Service and taking away some of its independence.

Clyde T. Ellis, executive manager of the National Rural Electric Cooperative Association, told the committee "the future of REA . . . would be seriously affected" by some provisions of the bill. Past accomplishments, he said, have been dependent to a great extent upon REA's independent or semi-autonomous status within the Department of Agriculture.

At present, the REA administrator is appointed by the President. Under provisions of the bill, the administrator would be appointed by the Secretary of Agriculture, and the Secretary would have the power to reallocate the powers of the administrator as he sees fit.

Ellis also contended the change of name "would actually cause REA and the Rural Electrification Program to suffer a considerable loss of identity, public acceptance, and prestige." On this point, he further argued that the change might give some people the idea that the agency is a service, rather than a loan agency.

Committee action on the proposals may be delayed until near the end of the present session of Congress.

TOP SPEAKERS at the RMEL annual meeting were, left to right, George M. Gadsby, EEI president; J. E. Loiseau, president of Public Service Co of Colorado; and John S. Skillman, Technical Coordination Division, National Production Authority

Industry Must Mold Opinion to Keep from Being Nationalized, RMEL Told

To protect property belonging to millions of stockholders against nationalization, top utility management must take an active part in forming public opinion, J. E. Loiseau, Public Service Co of Colorado, said at the annual meeting of Rocky Mountain Electrical League in Sante Fe Sept. 9-12.

Management responsibility now not only requires primary operating responsibility, planning, construction, and financing, he said, but also responsibility for preservation of investors' properties against any forms of socialization. He attacked particularly the preference clause, which he said should properly be named the "discrimination clause." He said its effect was extremely detrimental to millions of taxpaying customers served by private utility companies, since in the end they pay resulting discriminatory taxes. To emphasize the need for informing the public, he said a survey showed 89% of electric companies' stockholders and 98% of their customers had never even heard of the preference clause.

In this same vein, Edison Electric Institute President George Gadsby pointed out the need for closer group action by the industry.

"Socialization of the power industry is part and parcel of the program of the New Deal and Fair Deal," he said, "and the objectives of the present administration in this field are four-square with the principles laid down in the platform of the U. S. Socialist Party in 1920".

After outlining the four major organizations into which industry activities have fallen, he pointed out that their combined annual budgets are approximately $3 million, or about 0.12% of combined electric revenues. The figures, he said, told their own meager story.

Edwin Vennard, Middle West Service Co, said the primary cause of loss of freedom is the public's ignorance of economic facts and principles. The basic problem is to show that the free enterprise system produces more of the things people want. He said communication methods have been refined to the point where employees can be converted after ten hours of discussion face to face.

Failure to cancel orders when material is no longer needed, and placing duplicate orders on more than one mill have been responsible for much of the difficulty encountered by National Production Authority, John Skillman, director of Technical Coordination Division, told the group.

In many cases, he said, applicants who failed to renew third quarter filings for the fourth quarter explained that by using advance shipments and "a carload of brass they just happened to find out in the back lot" they had satisfied their requirements. This creates a bad situation, he said, because the materials to which they are entitled may be held in expectation of a late application, leaving a smaller total available to those who need it. He said NPA accountants have been in the field, and by Sept. 15 would have completed compliance investigations in 1,000 cases.

M. M. Boring, General Electric Co, posed three questions which he said the electrical industry should ask itself before placing on others all the blame for shortage of young engineers:

1. Are we using our manpower to the best possible advantage?

2. Have we really tried to use the man trained in a trade school for two years?

3. Have we investigated well enough the ways we may be able to use women?

The League elected J. W. Cryder, president and general manager of Colorado Central Power Co, Englewood, Colo., as president. Next year's meeting will be at Glenwood Springs, Colo.

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New Utah Unit Planned

The Southern Utah Power Co has awarded a contract to the Lym Engineering Co, Salt Lake City, for construction of a 5,000-kw steam generating plant. The new steam plant will be located adjacent to the present company installation on Coal Creek near Cedar City. All generating equipment is to be installed by June 15, 1952.

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Becomes PUC Member

Col Bernard L. Robinson has succeeded Gen Gordon R. Young as a member of the District of Columbia Public Utilities Commission.

PEA Group Urges Makers Improve Visibility of Indicating Instruments

Makers of mechanical indicating instruments were told last week that basic design changes are needed to improve instrument visibility if they are to be effective in the centralized control rooms of today's modern power plants.

Recommendations for improvements were made at an informal forum of the Pennsylvania Electric Association's joint subcommittee on instrument design at Philadelphia on Sept. 17. The subcommittee was formed by the Electrical Equipment and Prime Movers Committees. Participating in the forum were 12 manufacturers of mechanical indicating instruments.

Shadows, Glare Cut Visibility

Shadows on dials and veiling glare are hampering the ability of power plant operators to pick out and read key instruments quickly in emergencies, the manufacturers were told. However, much of the trouble can be overcome by modification of case and dial changes, it was pointed out.

Subcommittee Chairman Walter B. Morton, Pennsylvania Power & Light Co, said the growing maze of instruments in modern power plant control rooms is complicating the operator's task of picking out and reading the right instrument quickly in emergencies. Color coding of instruments, now being investigated by PEA committees (See Page 83) can help operators pick out the right instrument, but changes in dial illumination will be needed to get rid of shadows cast on the dials by overhanging instrument cases.

Improvement Needed

Morton pointed out that electrical instrument makers have made improvements in the design of their dials and cases. Similar improvement is now needed in mechanical instruments, he said. If instruments are designed to admit maximum light to the scales and control room illumination is of proper quality, Morton said, there will be no confusing shadows on dials and a minimum of reflections and veiling glare on glass fronts. Moreover there will be no need for using nonglare glass or internal illumination of instrument scales.

Most of the instrument manufacturers participating in the forum took a dim view of the subcommittee proposals. Dropping of internal illumination of dials was opposed on the basis that it was needed in other industries where lighting was not as good as in power plants. Others found color coding of instruments distracting or better applied to scale markings or name plates. Those recognizing the need for design changes urged thorough investigation along broad and scientific lines. Others urged a cautious attitude of watchful waiting for further evidence of need for change.

Edward Schlotters, chairman of PEA's Electrical Equipment Committee, announced that an instrument design symposium would be held at a joint meeting of PEA's Electrical Equipment and Prime Movers Committees in Philadelphia during February, 1952, to present any developments that become available in the interim.

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Kentucky Utilities Won't Quit Suit Against Co-op

Kentucky Utilities Co last week refused to withdraw its court suit against a $30 million co-op steam plant being built in Clark County after the co-operative had offered a "trade."

East Kentucky Rural Electric Co-operative Corporation had announced withdrawal of a protest against KU's plan to expand its Green River Plant. The co-op urged KU to drop its suit against the Clark County plant, in exchange for which it offered to withdraw opposition to another KU plan, this for expanding a plant at Tyrone.

KU countered with an offer to install a REA generating unit at Tyrone, to be operated by the co-op. "This," a KU spokesman said, "would eliminate any possible need for any power plant or transmission lines being built by East Kentucky."

The private utility contends the co-op plant and transmission system would duplicate facilities already in existence.

July Output Up 13.5% Over 1950; Records Set

Electric utility production of energy for July of this year is the highest total for that month on record. The Federal Power Commission reports that output in July was 30,392,490,000 kwhr. This represents an increase of 13.5% over July of last year and 1.9% over the 29,839,806,000 kwhr produced during June, 1951.

Production for the year ended July 31, 1951, reached a record level of 355,429,583,000 kwhr. It exceeded by 1% the previous high set during the period ended a month earlier and topped output for the year ended July 31, 1950, by 15.6%. Production for that period totaled 307,591,336,000 kwhr.

Water power plants produced 8,281,156,000 kwhr in July, an increase of 10.3% over the same month a year ago. As a percentage of July's total production, water power output decreased from 28.1% last year to 27.2% this year. Fuel plants produced 22,111,334,000 kwhr during July.

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New Niagara Unit, Tunnel

Ontario Hydro-Electric Commission has decided to build a seventh 100,000-hp unit at its power development at Niagara Falls, raising total capacity there to 700,000-hp. The commission has also decided to construct a second tunnel under Niagara Falls, Ont., to supply the plant (EW, May 14, p 11).

Kw for the H-Bomb

Atomic Energy Commission is using about 300,000 kwhr a month in construction of the hydrogen bomb materials plant on the Savannah River near Aiken, Ga.

South Carolina Electric & Gas Co furnished 272,000 kwhr for the operation from Aug. 17 to Sept. 7. Usage is expected to increase as construction schedules gain speed.

Contracts have not yet been signed for electric energy needed for actual operation of the plant, but it will call for a huge, firm supply.

Salary Freeze Thawed a Bit, SSB OK's Raises for Service and Merit

The government has applied some heat to the salary freeze. But the thaw still hasn't caught up with what's been happening on the wage side since the Jan. 25 wage-salary freeze.

The Salary Stabilization Board issued Regulation 3 permitting, within a 6% average limitation, individual salary adjustments based on merit and length of service. (This matches pretty closely the Wage Stabilization Board's Regulation 5 on individual wage increases.)

SSB, in Reg 2, also has approved continuation of profit sharing and other types of yearend or Christmas bonuses where, roughly, the bonus kitty of past years is not enlarged. (This parallels WSB's Reg 14 on bonuses for wage earners, but WSB wants to look at any bonus of more than 25%.)

The Economic Stabilization Agency, in Salary Order 1, has approved, further, cost-of-living adjustments for executives to match wage increases granted under escalator contracts at General Motors and elsewhere.

And SSB, in Reg 1, has permitted salary increases up to 10% above the salary level of January, 1950. (This jibes with the WSB 10% formula.)

What white collar salary administrators still need, however—and this is coming soon—is permission to match WSB's new cost-of-living policy which allows wages to reflect the rise in living costs since last January. Right now this amounts to 2.2%. Many employers are giving this much increase to employees under WSB jurisdiction. But they have thus far been unable to raise the pay of employees such as draftsmen and technical employees who in the past received the same increase as other workers.

Executive-type employees can now be given salary increases for merit or length of service up to 10% in any calendar year. But the increases must not exceed an average of 6% of the payroll for the group affected.

JAMES LAUDERDALE, former member of the District of Columbia Public Utilities Commission, heads Public Utilities Branch of Office of Price Stabilization

Depa Clarifies Recent Regulations for Obtaining Controlled Materials

Defense Electric Power Administration has clarified several recent CMP regulations relating to procurement of material for minor requirements:

1. Repairmen doing work for electric utilities must use DO-H-4 rating or the H-4 symbol on orders for material required for this work. Materials ordered by use of the H-4 symbol constitute a charge against the utility's minor requirements quotas of controlled materials.

2. When "B" products are sent back to the manufacturer for repairs, DO-H-4 ratings are required, but an allotment is not. This is because the allotment a manufacturer receives from his industry division also covers controlled materials necessary for repairs, such as copper for generator and transformer windings.

3. Use of the DO-H-4 rating on any item of equipment costing more than $10,000 for minor requirements purposes requires a special authorization from Depa.

Requests for such authorization should be addressed to the chief of Depa's Minor Requirements Branch. Such requests should give a complete description of the equipment, number of units, supplier's name, purchase value, and order number if an order has been placed. In addition, the request should describe the location and facility where the equipment is to be placed, and why the existing equipment is inadequate.

If the equipment is to be used as spare or stand-by, the utility must clearly indicate this and justify its proposed use on the basis of previous experience.

Should the equipment fall in the type which requires submission of a form DEPA-5, such form must be submitted in addition to the request.

Claim CMP Ratings Fall Short of NPA's Promises

Some electric equipment manufacturers are beginning to wonder if CMP is all it is cracked up to be. In a few instances, at least, the CMP ratings on purchase orders are not proving to be the "certified checks" promised by the planners.

Most companies were not surprised when they could not place some of their orders from third quarter allotments. They chalked it up to the usual confusion of a conversion period. But already some orders based on fourth quarter allotments are being turned down by the mills.

One possible explanation is that more "checks" have been written than there is controlled material in the "bank." Steel mills last week were adding up total valid orders to see if they balance with available supply.

There are also other explanations given by NPA:

A few companies have not been sticking to CMP regulations. On fourth quarter advances they placed duplicate orders and failed to cancel when one was filled.

Also there is some suspicion that buyers aren't as aggressive in shopping around as they could be. Direction three to order M-1 may give a little relief in this regard. The direction sets up a method of reestablishing normal customer-mill relationships. One result of this direction will be that mills now have some discretion in taking care of their regular customers.

'A' and 'B' Products, CMP Materials Reclassified

Recent changes have been made in classification of "A" and "B" products and controlled materials which will affect material allotments to electric utilities.

Revised classification is carried in the booklet, "Product Assignment Directory and Official CMP Class B Product List," now available at the National Production Authority in Washington.

Now classed as "B" products, the following items will be classed as controlled material beginning Jan. 1, 1952: Iron and steel strand, including guy wire and steel strand static wire; wire rope and steel cable; welded wire fabric reinforcing.

Stacks are changed from a "B" to an "A" product, Jan. 1.

Grinding mill balls are changed from an "A" to "B" product, Jan. 1.

Fabricated metal concrete reinforcing bars (standard bar shapes) are changed from "B" to "A" on Oct. 1.

To clarify present classification on a number of items causing difficulties, Depa has given out the following list:

"A" product—Grating (sidewalk), boiler galleries, iron and steel stairs, staircases, railings, and grille work.

"B" product—Precipitator for steam power plant.

Controlled material—ACSR, forged and bored pipe. On the pipe item, utilities must file the weight of billet from which pipe is fabricated.

Utilities have been asked to review filings on form DEPA-3S and DEPA-9 and file amendments on DEPA-9 promptly where necessary to make requirements conform to changes in classification.

Changes in minor requirements quotas may be made by filing amendments on DEPA-8.

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Vieregg Heads Depa's Power Planning Branch

Arthur B. Vieregg is new chief of the power coordination and planning branch of the Defense Electric Power Administration. He succeeds Robert Brandt who was recently moved up to director of the Power Supply Division.

Vieregg has been with Depa since last December as a regional engineer. He was formerly associated with the Central Power Co and the Rural Electrification Administration. Just prior to joining Depa he was a budget examiner and electric power consultant with the Budget Bureau in Washington.

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Manufacturers Protest to NPA, Get More Metals

Loud protests from electrical equipment manufacturers on fourth quarter allotments (EW, Sept. 10, p 111) may have been a factor in obtaining additional allotments for transformer, switchgear, and pole-line hardware makers.

National Production Authority is taking steps to ease controlled material for its electrical equipment Division. The extent of this easement is not yet clear, but it will mean slight increases (10 to 15%) for manufacturers of certain items. The division was readying these allotments for distribution last week.

The increases, still far short of requirements, came after strong presentation of the case to the top NPA materials committees by the division and after more than a hundred manufacturers had swooped down on the controllers to demand more materials.

The Specialty Transformer Industry Advisory Committee told NPA that shortages of copper wire, silicon, and carbon steel have lengthened delivery schedules for their product from 1-2 months (pre-Korea) to about 3-12 months. NPA urged the manufacturers to substitute electric-conductor grade aluminum for copper wire if it can be fitted into production lines.

Members of the Power and Distribution Transformer Industry Advisory Committee were told by NPA that the first quarter of 1952 should bring some improvement in materials allotments for the industry. Although there will be no appreciable increase in the supply of copper until "sometime" in 1952, NPA said the industry share may be increased for first quarter because heavy transformers are vital to military and defense-supporting needs.

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Industry M Orders

Copies of this amendment may be secured from the National Production Authority, Washington 25, D. C.

Amendment to M-22 restricts use of **aluminum** to persons qualifying as producers, smelters, fabricators, or reclaimers under general definitions. Also revises definitions of aluminum scrap and requires disposal of aluminum scrap every 30 days or whenever a minimum carload is accumulated, whichever occurs first.

June Energy Sales Rise 13.3% Above 1950 Level

Sales of electrical energy in June exceeded those for the same month a year ago by 13.3%.

Electrical utilities sold 25,716,567,000 kwhr to ultimate customers in June of this year compared with 22,694,422,000 kwhr in June, 1950. Revenue from ultimate customers totaled $456,313,300, or 10% more than the $414,734,400 received in June last year.

Average usage per residential or domestic customer reached 1,917 kwhr in the 12 months ended June 30, 1951. This represents a rise of 8.6% over the average usage of 1,765 kwhr for the same period a year before.

The average annual bill amounted to $54.44, up 6% from $51.36 for the 12 months ended June 30, 1951. Revenue per kilowatthour declined 2.4% from 2.91¢ to 2.84¢.

Classification of Sales, June

Kilowatthour Sales June	Million Kwhr 1951	1950	Per Cent Change
Residential or domestic	5,819	5,072	+14.7
Rural (distinct rural rates)	775	694	+11.5
Commercial or industrial			
Small light and power	4,683	4,107	+14.0
Large light and power	13,099	11,547	+13.4
Street and Highway Lighting	216	192	+12.7
Other public authorities	637	583	+9.3
Railways and railroads			
Street and interurban railways	257	261	−1.6
Electrified steam railroads	185	189	−2.5
Interdepartmental	47	49	−2.8
Total to ultimate customers	25,717	22,694	+13.3

•

REA Co-op to Build Plant

Construction of Eastern Kentucky Rural Electric Cooperative Corp's new $12,250,000 generating system at Ford, Ky, is expected to be started this December, provided approval is granted by the Rural Electrification Administration.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
1951									
Sept. 13	**2.85**	**2.87**	**3.03**	**4.06**	**4.24**	**4.57**	**5.48**	**6.16**	**7.01**
Sept. 6	2.85	2.87	3.04	4.06	4.23	4.57	5.49	6.15	7.02
END OF QTR.									
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25

Data: Reis & Chandler, Inc.

July Operating Revenues Rise 9.4% Over '50 Level

Electric operating revenues of the larger privately owned utilities in the United States in July totaled $423,239,000, an increase of 9.4% over July, 1950, according to preliminary figures announced by the Federal Power Commisison. July, 1950, revenues amounted to $386,984,000.

Gross income in July, including other utility operating income, came to $82,310,000, a decrease of 2.4% for the month. Net income was down 7% to $57,008,000 from the $61,299,000 reported for July, 1950.

Revenue deductions (including operating expenses, depreciation, and taxes) were $345,230,000, 12.3% over those for July of last year.

Pubco, Utility Subsidiary, Starts Drilling for Gas

Pubco Development, Inc. a subsidiary formed by Public Service Co of New Mexico for acquisition and development of natural gas properties, began drilling on its first well early in September. As of Aug. 17 it had acquired leases on 6,495 acres of land in San Juan and Rio Arriba Counties in northwestern New Mexico (where the first well is being drilled) on land which already has proved to be gas bearing.

In a recent letter to its own stockholders Public Service announced it expected to issue to stockholders of record at a future date, without cost to them, assignable rights to buy common stock of Pubco on a share for share basis at par value of $1 per share.

Pubco was set up in June, 1951, with one million shares of common stock, par value $1 per share. Public Service purchased 605,978 shares at par to furnish working capital. Plans call for the drilling of about ten wells a year beginning in 1952, with revenues from one well being used to finance drilling of the next.

Primary purpose for the formation of Pubco is to acquire new gas reserves which will be used for generation of electricity in Public Service's rapidly expanding system following expiration in 1959 of a ten-year contract under which it now purchases gas. Studies indicate that the company can construct a pipeline and deliver gas to the Albuquerque area substantially under the present contract cost.

FINANCIAL BRIEFS

Pennsylvania Power & Light Co has asked PUC approval to increase rates for large commercial, industrial, and resale customers by about $2,730,000 annually. Pres Charles E. Oakes said increased charges will enable the company to maintain its present level of earnings "so as to make possible the attraction of investors to supply the $88.5 million of additional equity and other capital required to finance the company's $143 million 4½-year construction program.

Standard Gas & Electric Co and **Philadelphia Co** have filed a plan with SEC proposing the distribution by Philadelphia of 1,038,171 shares of the 5,750,000 shares of Duquesne Light Co common stock it owns in partial liquidation of Philadelphia. The stock will be distributed in ratio of one share of Duquesne common to each five shares of Philadelphia common.

Washington State Legislature has increased the tax on gross income of utilities in the state from 3 to 3.3%, a jump of 10%.

Electric Utility Financing

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
	WEEK OF SEPTEMBER 19-26			
Bonds				
Province of Ontario, Hydro-Electric Power Commission	3¼% debs, 1972	$50,000	97.75%	3.40%
Common Stock				
Utah Power & Light	175,000 sh	4,988	$28.50	6.32%
	SCHEDULED FOR OCTOBER		Bid Date	
Bonds				
New England Gas & Electric Association	coll tr, 1971	$ 6,115	Oct. 1	
Public Service of Colorado	1st mtg	15,000	Oct. 2	
Arkansas Power & Light	1st mtg	8,000	Oct. 9	
Pennsylvania Electric	1st mtg	5,000	Oct. 9	
Utah Power & Light	1st mtg	9,000	Oct. 29	
Ohio Power Co	1st mtg	15,000	Oct. 30	
Ohio Power Co	serial notes	7,000	Oct. 30	
Preferred Stock				
Pennsylvania Electric	30,000 sh	3,000	Oct. 9	
Public Service Electric & Gas	249,942 sh	249,942	Oct. 15*	
Common Stock				
Pennsylvania Power & Light	542,484 sh (1-for-7, record Sept. 18, $24)	13,020	Oct. 3**	
Central & South West	500,000 sh		Oct. 16	
Public Service of Indiana	325,000 sh (1-for-10, record Oct. 9)		Oct. 24**	
Consumers Power	561,517 sh (1-for-10, record Oct. 17)		Nov. 2**	
	UNSCHEDULED—UNDER CONSIDERATION			
Bonds				
Florida Power & Light	1st mtg	$10,000		
Preferred Stock				
Toledo Edison	50,000 sh	50,000*		

* Negotiated Sale.
** Expiration Date.

Ohio Edison Asks PUC to Drop Newton Falls Suit

The Ohio Edison Co has asked the state Public Utilities Commission to dismiss an application filed by Newton Falls prohibiting the utility from supplying electricity in the village.

In an affidavit and brief submitted to the commission, the company said it had a perpetual franchise to furnish electricity to local users. The village, however, contended the municipal light plant, which serves more than 90% of local electric consumers, was capable of serving them all.

Since a suit filed by the village in 1942 to evict the former Ohio Public Service Co from Newton Falls is still pending in Trumbull County Common Pleas Court, Ohio Edison maintains the commission is under duty to dismiss the application.

MEETINGS

Edison Electric Institute
Merchandising Committee, Nela Park, Cleveland, Ohio, September 24-25; Prime Movers Committee, Statler Hotel, Buffalo, N. Y., October 1-2; Meter Service Committee, Purdue University, Lafayette, Ind., October 1-3; Electrical Equipment Committee, New Ocean House, Swampscott, Mass., October 8-9; Transmission-Distribution Committee, Sheraton Hotel, Rochester, N. Y., October 10-11.

International Association of Electrical Inspectors
Western Section, Hotel Fontenelle, Omaha, Neb., September 25-27; Eastern Section, Hotel Claridge, Atlantic City, N. J., October 1-3; Southern Section, Hotel John Marshall, Richmond, Va., October 15-17.

Pennsylvania Electric Association
Transmission-Distribution Committee, Hotel Concord, Northeast, Pa., October 11-12; Hydraulic Power Committee, Irem Temple Club, Dallas, Pa., October 11-12; Joint Relay-Communications Committee, Emerson Hotel, Baltimore, Md., October 18-19; Electrical Equipment Committee, Penn Alto Hotel, Altoona, Pa., October 22-23; Meter Committee, Arlington Hotel, Oil City, Pa., October 25-26; Prime Movers Committee, Fort Stanwix Hotel, Johnstown, Pa., November 1-2; Systems Operation Committee, Split Rock Lodge, Split Rock, Pa., November 8-9.

American Society of Mechanical Engineers
Fall Meeting, Hotel Radisson, Minneapolis, Minn., September 25-28; Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., November 25-30.

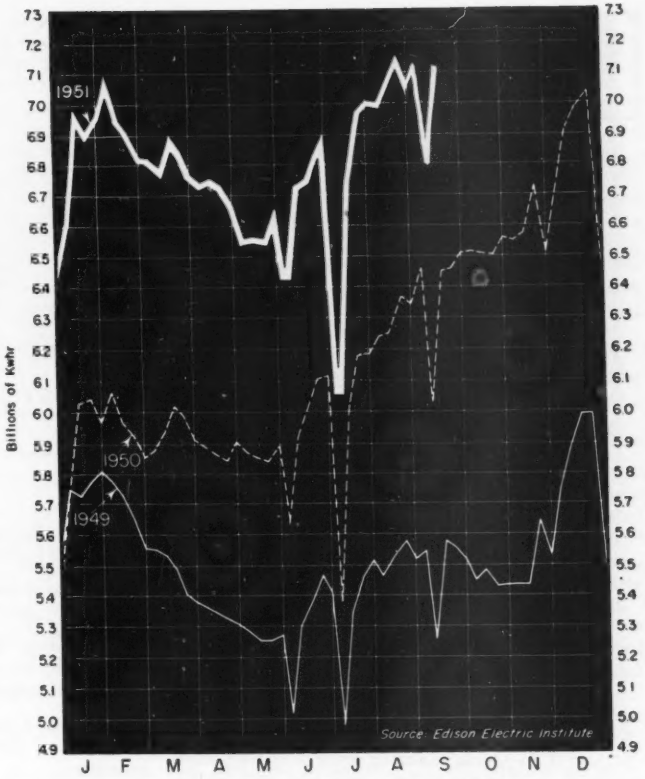
Iowa Utilities Association
Management Conference, Fort Des Moines Hotel, Des Moines, Iowa, October 1-2.

Southeastern Electric Exchange
Engineering-Operation Section Conference, John Marshall Hotel, Richmond, Va., October 4-5; Accounting Conference, Sir Walter Hotel, Raleigh, N. C., October 12-13; Sales Conference, Roosevelt Hotel, New Orleans, La., October 31, November 1-2.

★**Rural Electrification Administration**
Generating-Transmission Cooperatives Conference, Agriculture Department Bldg., Washington, D. C., October 8-12.

National Electrical Contractors Association
Annual Convention, Shoreham Hotel, Washington, D. C., October 8-12.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, Ohio, October 9-10.



Output Week Ended Sept. 15—7,137,652,000 Kwhr

Weekly Output, Millions Kwhr		
1951	1950	1949
Sept 15 7,138	Sept 16 6,449	Sept 17 5,579
Sept 8 6,795	Sept 9 6,029	Sept 10 5,258
Sept 1 7,146	Sept 2 6,459	Sept 3 5,544
Aug 25 7,077	Aug 26 6,346	Aug 27 5,523
Aug 18 7,164	Aug 17 6,370	Aug 16 5,579
Aug 11 7,070	Aug 12 6,253	Aug 13 5,530
Aug 4 7,003	Aug 5 6,247	Aug 6 5,466
July 28 7,005	July 29 6,190	July 30 5,518
July 21 6,975	July 22 6,186	July 23 5,462
July 14 6,739	July 15 6,006	July 16 5,342

Percent Change from Previous Year			
	Sept 15	Sept 8	Sept 1
New England	+ 4.1	+ 2.7	+ 3.1
Mid-Atlantic	+ 8.9	+ 9.2	+ 6.3
Central Industrial	+ 6.9	+ 9.1	+ 7.7
West Central	+12.8	+14.3	+15.1
Southeast	+12.8	+12.9	+11.7
South Central	+29.3	+48.9	+36.1
Rocky Mountain	+ 3.6	+ 2.0	— 5.6
Pacific Coast	+11.8	+12.1	+13.3
Total United States	+10.7	+12.7	+10.6

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 10-12.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, La., October 10-13.

Association of Edison Illuminating Companies
Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., October 11-13.

National Association of Railroad and Utilities Commissioners
Francis Marion Hotel, Charleston, S. C., October 16-19.

Public Utilities Advertising Association
Hotel Cleveland, Cleveland, Ohio, October 18-19.

National Association of Corrosion Engineers
South Central Region Meeting, Robert Driscoll Hotel, Corpus Christi, Tex., October 18-20.

National Electronics Conference
Annual Conference, Edgewater Beach Hotel, Chicago, Ill., October 22-24.

American Institute of Electrical Engineers
Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

Electrical Inspectors' Association of British Columbia
Annual Conference, Hotel Georgia, Vancouver, B. C., November 2-3.

Northwest Public Power Association
Accounting Section, Governor Hotel, Olympia, Wash., November 8-9.

National Electrical Manufacturers Association
Chalfonte-Haddon Hall, Atlantic City, N. J., November 12-15.

Pacific Coast Electrical Association
Annual Hawaiian Conference, Royal Hawaiian Hotel, Honolulu, T. H., November 29-30.

New Jersey Utilities Association
Annual Meeting, Seaview Country Club, Absecon, N. J., November 15-17.

Wisconsin Utilities Association
Electric-Gas Sections, Sales-Engineering Divisions, Schroeder Hotel, Milwaukee, Wis., November 14-16.

★Addition this week.

WASHINGTON COMMENT

JESSE MOCK

Keep new industrial plants outside the bull's eye of a possible atomic bomb target but not out of the service range of electric and other utilities.

This is the advice given by federal and local planners in seeking to implement President Truman's industrial dispersal program. Since the program appears to be gaining appeal among civic groups, as well as defense planners, it is time to take a peek at its probable effects on the electric power industry.

Planners are aware of the major role electric power plays in all new industry, and attention is given to the availability of electric power in making dispersal plans.

A Plant's No Good Without Power

National Security Resources Board, the federal agency charged with pushing the program, has this suggestion in its booklet, "Is Your Plant a Target?": "See that comprehensive plans for proposed dispersed sites are realistically based on such studies as . . . existing transportation and utility grids."

In a booklet entitled "Industrial Dispersal" put together by Seattle and Kings County (Washington) groups, availability of electric power is given a high priority in selection of proposed sites for dispersed plants.

The publication suggests 21 industrial sites in the Seattle marketing area. All of these are rated as to utilities, labor supply, and other requirements of new industrial plants. Only two of the sites have electric power availability rated as "limited." The other 19 have power availability ratings of "good" or "excellent."

On the map accompanying the Seattle brochure, electric transmission lines are shown at or near each of the sites recommended for plants.

Dispersal Should Appeal to Utilities

For the power industry, the "dispersal" program should be more appealing than the "decentralization" program which has been widely discussed in the past. "Dispersal" means building a new plant at least a mile or two distant from existing plants and 10 to 20 miles from existing industrial concentrations.

On the other hand, "decentralization" means moving new plants to thinly industrialized areas.

For the power industry, "dispersal" would generally call for expansion of present facilities to serve the new plants. "Decentralization" would call, in many cases, for entirely new plants and transmission systems.

If the dispersal program is catching on, as government planners believe, electric utility leaders should be in on it from the beginning.

Because electric utilities have always had to plan system improvements and expansion on a large and long-range scale, they can bring valuable experience to area planning committees. On such committees, their officers would be in a position to guide the formulation of plans with an eye on availability of electricity.

Since utilities will be called on to furnish a good deal of information, in any case, they might well place a member on planning committees to see that the information is correctly interpreted.

The scarcity of materials during the present mobilization period, when many new plants are being planned, will call for some close figuring on the part of the utilities.

It would be wonderful to echo the old cry, "We'll bring you electric power—no matter where you locate your plant." But that just isn't possible in the light of the present materials situation.

A utility man on a planning committee would know the situation, and possibly could head off trouble before potential plant sites were offered for development.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Cable for the 275-kv British Grid will have 91 wires accumulating to 1.119 in., wrapped with 230 paper tapes, copper fabric screen, and lead of 0.12 in. for sheath. Gas pressure will be 200 psi.

Panel mounted instruments in control rooms could well be rendered adjustable from the front without removal.

Nickel-cadmium batteries have graphite in the nickel oxide to improve conductivity and in the iron oxide to facilitate fabrication.

Auxiliaries in duplicate are hardly necessary if they have reliabilities as high as those of the boilers and turbogenerators.

Transients are important because they are the basis of all communication; no signals can be sent or received with unvarying current.

Luminous ceilings solve several of the problems of light distribution in control rooms.

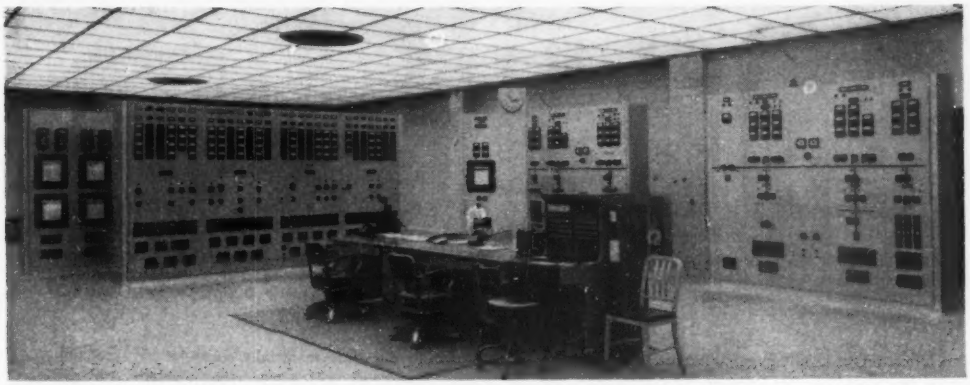
River flow insufficiency is limiting more and more of the new plant sites to predetermined ultimate capacities; will the next move be gas turbines, cooling towers, or superposition?

Storage batteries can be counted on to give up to 15% increase in capacity after the first few break-in cycles of charge and discharge.

Turbogenerator start-up when boiler pressures have only reached about 50 psi is feasible but requires (1) separate, dependable drive for the lubricating oil pumps and (2) other than hogging-jet means for establishing the vacuum.

Pole stringency in the 35- and 40-foot Class 4 and 5 brackets might be relieved in the medium and light storm loading areas if designs were aimed at use of Class 6 and 7 in the Southern yellow pine area.

Ash tracks under removed low-pressure boilers provide in one station a plenum chamber for admission of combustion air with least disturbance to plant ventilation.



CONTROL ROOM of Philadelphia Electric Co's Barbadoes Station is evenly lighted by a complete ceiling of translucent diffusing plastic backed by cold cathode fluorescent tubes. Shadows and reflections in instruments are practically non-existent

Color Coded Switchboards— Newest Step In Control Room Design

In complex control rooms of today's power plants, color coding of switchboards, coupled with glare-free lighting and careful instrument design, can ease the operator's job of picking out and reading instruments in a hurry. The case for color coding and what's been done so far is told here

WALTER B. MORTON, Station Electrical Engineer
Pennsylvania Power & Light Co, Allentown, Pa.

Designers of power plants have too frequently been slow to follow their own advice in providing better lighting for operators and workers. The complexity of the modern power plant control board has grown to the point where hundreds of instruments and literally thousands of control switches and indicating lights are combined in one single large room for the centralized control of a modern plant where boilers, turbines, their auxiliaries, and in some cases, electric switchyards are all controlled from the same group of control switchboards, in many cases by only one or two men.

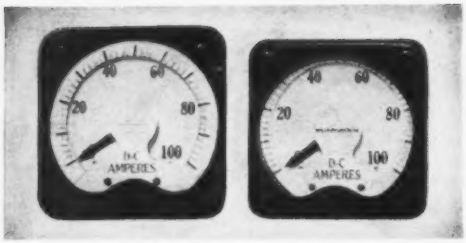
Such a setup makes it imperative that instruments be read quickly and easily in time of trouble; literally so "that he who runs may read." Adequate lighting of control rooms is a prime essential to efficient operation. One error resulting from improper illumination of a generating station board or poor visibility of an instrument scale on this board can conceivably involve repair or outage costs many times greater than the cost of providing proper illumination and readable devices.

Recent years have seen outstanding progress in all phases of illumination. With the improvements in lighting came realization that a necessary adjunct to better light is a new concept of paint finishes and harmony of colors. This concept achieves freedom from eyestrain and affords the maximum in cheerfulness, architectural beauty, and pleasant working surroundings, not only in the home but in offices and factories as well.

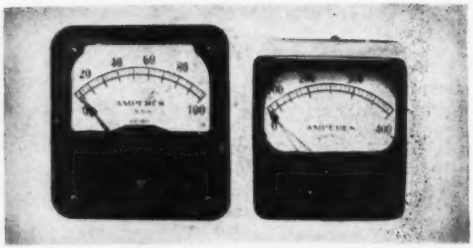
Designers of power plants too are now beginning to recognize the importance of providing adequate lighting and proper paint finishes in control rooms and, along with these, the necessity for improving the readability of instruments and devices on control boards.

Admittedly, the major seeing problem in a control room is the ability to read the instruments quickly and accurately. The principal problem of the lighting engineer is to provide adequate light on the instrument dial so that the operator can read the instrument quickly without the obstacle of shadows and reflected images appearing in glass fronts of instruments to block out or veil the reading on the dial.

Four Basic Principles . . . While these problems of shadows



BETTER VISIBILITY has been obtained in the improved Westinghouse instrument, on the left, by admitting more light on scale. Note shadow on upper part of scale on old design



TRANSPARENT TOP eliminates shadows on instrument at left. Model was developed by Weston Electrical Instrument Corp and Public Service Electric & Gas Co for Sewaren Station

and reflection patterns appear difficult to resolve, they can easily be solved if the following fundamentals are adhered to.

1. Instrument cases should be designed to admit maximum amount of light. It is a fact that the more light admitted to the scale, the better the visibility and the less the possibility of reflected images in the glass face.

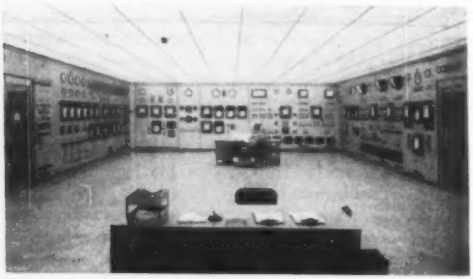
2. If the light source overhead is of even brightness over the entire ceiling (as is obtained from some form of infinite light source, such as indirect lighting, solid plastic or glass luminous ceiling or louver type with minimum pattern) and if the value of illumination on the dial is greater than the value of brightness reflected in the glass face, then the reflection will appear not to exist, and no interference with reading of dials will result.

3. Instrument dials should be white with black scale markings. This will not only provide superior visibility over black dials with white markings, but will tend to reduce reflections in the instrument fronts.

These three principles have consistently produced good results when followed in control room illumination practice. Now development in the art indicates that a fourth principle is needed to complete the list of basic precepts:

4. Scientific application of color, in the form of color coding, to instruments and devices.

In recent years, it has been brought to the attention of electrical instrument manufacturers that the need exists for providing more light on the dials of instruments. A number of manufacturers have made improvements in this regard.[1] Several new types of instruments have been brought out which are designed to provide more light on the dial and thus materially improve the readability of the instruments.[2] However, the problem still exists of having large groups of instruments along the length of a long switchboard which must be read quickly in time of trouble. It is asking a great deal of an operator to focus his attention instantly to a single instrument or gage among several hundred and read that gage without error with no identifying means except perhaps a small name plate which cannot be read any great distance from the board. This is true whether the gages are conventional size or miniature type. It therefore seems a necessary part of the solution to this whole problem to provide some means of quickly identifying and reading instruments.



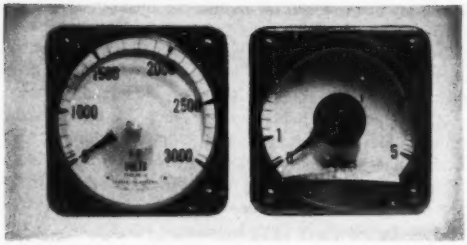
SUNBURY CONTROL ROOM of Pennsylvania Power & Light Co is being considered for further study of the color coding of electrical and mechanical devices for large switchboards

Color Coding Studied . . . To simplify the reading problem, various expedients have been resorted to—combining instruments in groups, providing instruments of different shapes, and providing control switches with differently shaped handles. As a more practical solution to the problem, investigation has been made recently of the possibilities of painting switchboard instruments in colors carefully coded so that each variety of instrument or each function of instrument would be designated by its own separate color or shade.

The general acceptance during the 1930's of the elimination of the unsatisfactory black surface for switchboards and substitution of some lighter color[3] has materially improved the cheerfulness and attractiveness of the control room and made it a better place for the operator to work. It seems logical to carry this a step further and provide color on the switchboard just as we provide color in the office, shop, or home. This color coding has been applied successfully to wiring and piping throughout the power plant for many years.

Mimic buses on control boards have been color coded for years. Recently, in connection with the development of a compact power plant control board that combines extensive control features on a small board, colored mimic buses were supplemented by images of boilers and turbines to facilitate focusing on instruments that must be read in a hurry.[4]

Recognizing the possibilities of switchboard color coding, the Pennsylvania Power & Light Co has collaborated with the Electrical Equipment Committee of Pennsylvania Electric Association in setting up a switchboard as an experiment in color coding. This has been with the collaboration of the Westinghouse Instruments Works.



NEW INSTRUMENT COVER for the General Electric instrument at left has enhanced readibility of scale markings. White dials with black letters are offered as standard

Instrument Color Scheme . . . A color coding scheme was set up for one six-panel section of a 20-panel switchboard (see cover). On it instruments, control switches, and auxiliary devices were color coded in accordance with the following color scheme:

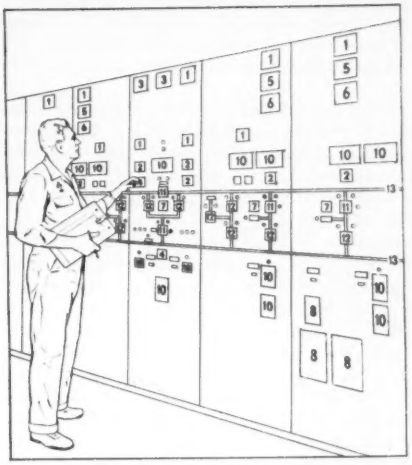
Red—Ammeters
Yellow—Voltmeters
Orange—Synchroscopes
Blue (Dark)—Wattmeters
Green—Varmeters
Blue (Light)—Miscellaneous Relays
Beige—Miscellaneous devices not associated with instruments or relays.

Control switches are black for oil circuit breaker control, and medium gray for motor-operated switches. The panel background is opalescent gray (aluminum) finish. The color code used the more outstanding colors for devices that require the greatest attention. For example, yellow was used for voltmeter indication, since it is usual to indicate a voltmeter or a voltage indication by a white or yellow light; red was used for ammeters as it is an outstanding color and the ammeter is one of those instruments that would be looked at more often than any other. Orange was selected for synchronizing instruments, jacks, and relays as it is a highly distinctive color. Other color selections were arbitrary.

In this coding scheme all instrument switches, jacks, and auxiliary relays associated with a primary instrument, such as a voltmeter or ammeter, were painted the same color as the instrument. Although this color coding of auxiliary relays is not necessary for the operator's convenience, it does assist the maintenance group, particularly when hunting trouble in a hurry, and it does add to the general plan of using color in control room for attractiveness and to eliminate the depressing black.

Little Work Involved . . . The actual work of repainting the instruments and devices on the experimental board involved slightly over a day's work for a skilled painter and an engineer. The engineer was assigned as a safety measure to prevent possibility of the painter operating any devices or getting into trouble with devices controlling energized equipment.

All operators, without exception, who man this station enthusiastically feel that the color scheme is beneficial. It has materially helped them in operation and they feel it adds to the attractiveness of the place where they work. Operators say the color coding will be of equal or greater value in unattended stations where less experienced operators are sent to operate equipment in emergencies. No major problems were encountered in the color coding of instruments and devices, and it does not appear that the cost should be excessive even when the repainting is done in the field. This is particularly true if the switchboard has been sprayed during fabrication with a plastic coating which serves as masking until the painting is completed. However, it is felt that if certain national committees can agree on a satisfactory standard color code not only for electrical instruments, but for mechanical as well, the devices can be furnished in color by the manufacturers and no supplementary field painting would be required. There would be no problem in manufacture as it would merely mean that manufacturers



About the Cover Picture

In full color on the cover of this issue is pictured the experimental switchboard at Pennsylvania Power & Light Co's Engleside Substation on which instruments and devices have been color coded for rapid identification by type and function. Numbers on this reproduction of the cover picture are the key to the color coding system used:

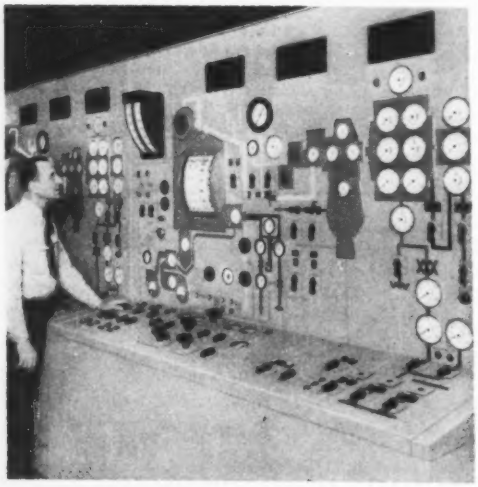
No.	Device	Color Code
1	Ammeters	Red
2	Ammeter Sw's	Red
3	Voltmeters	Yellow
4	Voltmeters Sw's	Yellow
5	Wattmeters	Blue
6	Varmeters	Green
7	Synchroscope Sw (& Scope)	Orange
8	Synchronizing Relays	Orange
9	Reclosing Relays	Light Blue
10	Miscellaneous Devices	Beige
11	OCB Handles	Black
12	Air Bk Sw Handles	Light Gray
13	Mimic Bus (66 kv)	Dark Green

would have to stock covers in colors rather than painting each individual case black before fabrication of the device. A joint committee of the Electrical Equipment and Prime Movers Committees of PEA is making progress in preparation of a preliminary code to start the ball rolling.

Mechanical Devices Too . . . Color coding of mechanical gages and devices presents more of a problem than does color coding of electrical instruments since there are more instruments and more classifications required. However, there is no insurmountable difficulty even with this greater number of devices since it is only necessary to prepare an adequate color code that will cover the various functions. It is true that mechanical instruments come in functions of pressure, flow, etc, for a variety of systems, such as air, oil, water, steam, etc, but it is not usual that in the control room all these devices would be on the same switchboard. Therefore, it seems that even though there is some overlapping of applications, it should be possible to use different shades of the same color to differentiate functions. Another possibility is the use of decalcomania symbols. This application of decalcomania is something that can be done by the switchboard user.

While some mechanical instrument manufacturers have taken some steps to improve the dimensions and configuration of mechanical instruments, there remains much to be done and progress has not been nearly so great as that achieved by electrical instrument manufacturers.

There has been some experimenting by manufacturers in the use of fluorescent powders for instrument scales utilizing black light to bring out the colors of the dials. This is excellent for such applications as aviation instruments or instruments in darkened chart houses of ships, where the operator is close to the instrument. Here the operator should not be blinded by high brightness that might impair his ability to see into the darkness beyond.



QUICKER VISUALIZATION of device location is achieved with this streamlined power plant control board that combines compact layout with colored mimic buses and colored images of boilers, turbines, piping, and other power station devices

However, in most control rooms, the operator may have to read an instrument scale quickly at a distance of 25 ft or more in a room that is illuminated for desk work. Any use of black light to bring out scale markings on dials requires a reduction in room illumination which is definitely a step in the wrong direction. By the same token, if devices are designed to admit maximum room illumination and this room illumination is of proper kind, so that glare and shadows are eliminated, there is no necessity for internal illumination of the dials (on a vertical board). Similarly there is no necessity for any of the so-called non-glare glass fronts for instruments (on a vertical board) if lighting is properly designed and if maximum light is admitted to the scales.

The PP&L Co is proceeding with a study of the color painting of instruments in a major power plant centralized control room and it is expected this can be accomplished without any major problems.

Any color coding schemes that are adopted by the industry should be held to definite standard colors. If too much personal preference is injected into various specifications for colored instruments, it can produce a major headache for the instrument manufacturers. However, if a standard code is adopted by a joint committee of the technical societies and of the NEMA, it does not seem that there should be a major problem involved for either the manufacturers or the users of the instruments.

Conclusions . . . The author's conclusions can be summarized by saying that the color-coded switchboard shown on the cover, and its illumination scheme, has clearly demonstrated to many interested observers that:

1. Color coding instruments and devices permits quicker and more accurate reading of instruments, materially improves the appearance and adds cheerfulness to the atmosphere of the control room.

2. Instruments can be eye-selected and read more quickly if properly designed to admit maximum of light and if provided with white dials with black letters.

3. There is no need whatever for so-called non-glare glass covers (which restrict visibility) on the type board illustrated on the cover if the instrument is properly designed to admit light, and if the light source is an infinite luminous source without appreciable amount of pattern. (Non-glare glass covers furnished in error for certain instruments on this board are being replaced with clear type by the manufacturer of the instrument because of this obvious conclusion).

Grateful acknowledgement is made by the author to H. F. Carroll, D. A. Campbell, and L. L. Nonemaker of Pennsylvania Power & Light Co, and to engineers of Westinghouse Electric Corp for ideas, cooperation, and assistance in the instrument color experiments. Credit is due the Electrical Equipment Committee of PEA for initiating action in the last few years toward improving the visibility of switchboard instruments and arousing interest in developing the art of control room lighting.

(1) Symposium on control room lighting and instrument design. Electrical Equipment Committee PEA. Hershey, Pa., May 1948.
(2) Control Room Lighting—Report of IES Subcommittee on Control Room Lighting, of Committee on Lighting of Central Station Properties—Illuminating Engineering, June 1951.
(3) Control Room Lighting and Light Colored Switchboards—W. B. Morton—Electric Journal—June 1935.
(4) Compact Board Affords Full Control of Plant Operations—P. E. Gourdon and H. L. Lowe, Electrical World, July 17, 1950.

Ewing Galloway Photo

DAIRY FARMS in particular can use electricity profitably to fill silos, grind grain, heat water, and clean the cow barns

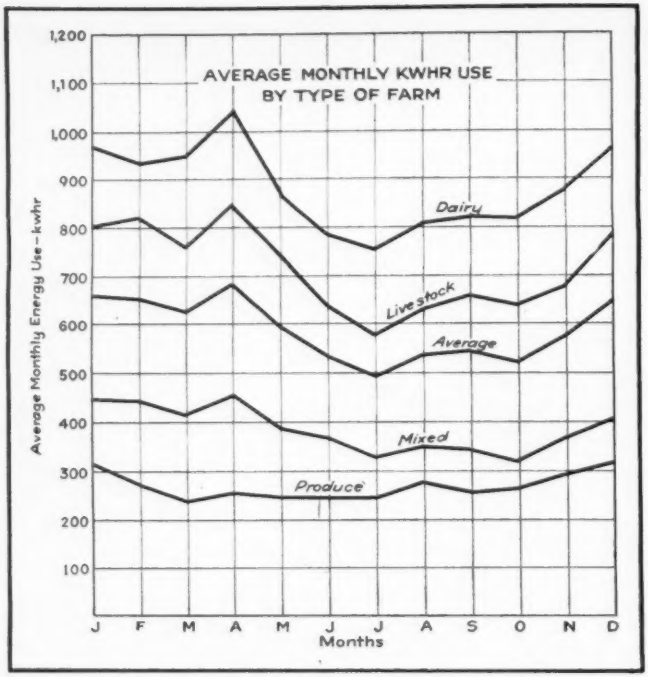
Build for Bigger Farm Loads

Up from 8,000 kwhr average per farm—double the national figure—to 12,000 in a few years is reasonable expectation for DeKalb County, Illinois. Study indicates largest potential increase is in farmstead applications

R. K. DALLAS, Central Illinois Light Company
J. N. GOSINSKI, Commonwealth Services Incorporated
E. W. LEHMAN and J. H. THOMAS, University of Illinois

Study and analysis of farm uses of electricity in an area where average annual use in 1950 was 8,000 kwhr indicates that an average annual use of 12,000 kwhr in the same area can be reasonably expected in the next few years. Well-operated farms deriving major income from dairy operation will be using an average of 19,000 kwhr; 12,000 kwhr average will be used by livestock, 9,000 kwhr by mixed, and 6,000 kwhr by produce farms. Distribution systems that are being built should be planned on that basis and changes in distribution systems should be made with these future loads in mind.

Domestic appliances are responsible for the largest portion of total use now by all except the largest of farm customers. Farm chore load offers the major potential for future load building. Even on the best farms, lighting was substandard. Promotion must be continued to realize this load. An important complement is adequate wiring. Electric heat for various purposes offers load building possibilities. The load factor of farm loads will be increasing.



SEASONAL EFFECT is most apparent on electricity usage of dairy farms

At the present time sales departments record the number of ranges and water heaters. In the future, records should be kept of each farm chore appliance having an annual use of about 1,000 kwhr. Future study of demand characteristics of such customers will be required to determine line transformer replacements and adequate design of the distribution primaries.

Saturations of refrigerators, electric ranges, water heaters, and home freezers were found to be 100, 73, 63, and 37%, respectively. Farm chore appliances, with the exception of milking machines and water systems, do not reach 50% saturation even among the dairy farms. The current outlook for use of farm chore appliances such as hay curing, barn conveyors, feed grinding, and others, according to this survey, can be the principal factor in raising average annual use from 8,000 to 12,000 kwhr in the next few years if the increase continues at the rate it has been for the past five years.

The area studied was DeKalb County, Ill., about 50 miles west of Chicago. Object was to determine the characteristics of present and potential loads with a view toward using the information for future planning of engineering and sales.

Average annual use among 1,450 farm customers in the area was about 7,000 kwhr in 1949 and 8,000 kwhr in 1950. This is double the state and national averages. Study of the area was made in 1949-50 in collaboration with the Agricultural Experimental Station, University of Illinois. Ninety-seven farms were selected on a random sample basis and were classified by the type of farm enterprise.

Potential load growth was explored with each of the customers in the sample with particular emphasis on domestic and farm chore portions. The economic justification of various domestic and farm chore equipment was considered and the desires of the individual farmer were discussed with respect to future operations. Analyses of domestic and farm chore energy use were made in detail for each of the sample farms.

Annual Kwhr Sales . . . Farms were classified on the basis of 50% or over of total gross income as being derived from dairy, livestock, mixed, and produce (grain and vegetable) operation. Average annual kwhr sales to each classification increased rapidly in the past three years, Table I. The order of kwhr use—dairy, 12,000; livestock, 9,000; mixed, 6,000; and produce, 4,000—indicates the inherent application of electricity which occurred on these various types of farm operations.

The corresponding highest use of farms for the dairy and livestock types is also shown in Table I. The significant value of 30,000 kwhr indicates the order of electricity use which is realized on a farm where the farm chore work is fully electrified and heating devices are fully employed. Farms having this high kwhr use have been studied by the Agricultural Engineering Department of the University of Illinois and it was found that all of the applications were economically feasible and justifiable.

The accompanying chart gives the use by months for the average farm and for the four types of farms. It should be noted that generally the highest sales are indicated for March and April, this being the period for extensive infrared heating for pig brooding. The December uses for the dairy and livestock type of farms were 90% of the preceding April kwhr use.

Connected Load and Demands . . . On each sample farm the connected load was determined for domestic and farm chore operation, Table II. Average connected load on the dairy type of farm was found to be 23 kw, with the highest 45 kw. Of this group, 35% had connected loads exceeding 25 kw.

Average 15 min noncoincident demand per farm is shown in Table II. The average demand of the dairy group was 6 kw and the highest demand 12 kw. The average demand of the produce group was 3 kw and the highest 7 kw. More than 50% of the dairy and livestock farms had demands in excess of 5 kw.

Demand characteristics were noted for both 15 and 30 min. In general 30-min demands were 90% of the 15-min.

There appears to be no definite relationship between farm kwhr use and kw demand, similar to the pattern

of residential use. The average load factor based on 15-min demand was in the order of 20% for all types of farms except produce, which was 15%, and the weighted average load factor was 18%. Table III shows average load factors and demand factors by type of farm.

Demand factors are higher on dairy farms than on any other type of farm even though the connected loads on these farms are generally higher than for other groups. In other words, the maximum demand on a dairy farm which has a certain connected load would likely be much higher than that on a farm of another type with the same connected load. For example, a dairy farm and a mixed farm included in the random sample had a connected load of approximately 25 kw. Maximum demand on the dairy farm was 5.8 kw and the maximum demand on the mixed farm was 4.6 kw, a difference of 26%.

Economy of the Area . . . The most important factors affecting the use of electricity are: (1) Size of farm enterprises; (2) whether owner- or tenant-operated; (3) time of service connection; (4) type of farm; (5) farm income; (6) quality and continuity of service; (7) educational program; and (8) new developments and their promotion.

DeKalb County is well known for its brand of hybrid seed corn and for many years has been operated at the highest order of agricultural efficiency and corresponding high return. Although the average income of Illinois farmers ranks high, the average income of the farmers in DeKalb County is twice as great as that for the state.

Average size of the farms is 167 acres. The large are in the order of 400 acres and the small, 50 acres. Many of the large owner-operated farms have helpers' residences in addition to the farm operation. These were not included in the particular farm loads and were considered as rural residences.

There has been a gradual increase in the number of tenant-operated farms. Some 46% of the farms are tenant-operated, the largest number being of the vegetable packing type, all of which are tenant farms. Average kwhr sales to the tenant farms were only 57% of the average to owner-operated farms.

TABLE I—Annual Kwhr Sales to Farms of Various Types

Type of Farm	Per Cent of Total	Average Annual Kwhr Sales 1948	1949	1950	Highest 1950
Dairy	22	9,525	10,477	12,250	30,000
Livestock	34	6,944	8,564	9,100	30,000
Mixed	29	4,260	4,635	5,643	12,000
Produce	15	2,809	3,193	3,895	14,800
Average	.....	6,037	6,913	8,009	.....

TABLE II—Average Connected Load and Demand per Farm

Type of Farm	1949 Average	1949 Highest	Connected Load—Kw Over 25	Demand (15 Min) Average	Demand (15 Min) Highest
Dairy	23.3	45	30%	6.0	12.2
Livestock	21.6	43	27%	5.2	10.2
Mixed	15.6	25	7%	3.7	6.8
Produce	11.8	20	0%	3.0	7.0
Average	18.0	.....	.....	4.5	.....

TABLE III—Demand and Load Factors of Specialized Farms

Type of Farm	Demand Factors—% Farms with Connected Load of 5, 20, and 45-kw 5	20	45	Annual Average Load Factor (15 Min Demand)
Dairy	60	30	20	21
Livestock	40	25	20	19
Mixed	30	21	10	20
Produce	....	14	....	15

TABLE IV—Potential Market for Farm Power

Type of Farm	1949 Kwhr	Increased Kwhr Domestic	Chore	Total	Total Kwhr
Dairy	10,480	1,300	7,100	8,400	18,900
Livestock	8,564	1,500	3,200	4,700	12,300
Mixed	4,635	2,600	1,700	4,300	8,900
Produce	3,193	1,800	600	2,400	5,600

TABLE V—Present and Estimated 1956 Saturation of Chore Appliances (%) (Over 800 kwhr Annual Use)

Appliance	Annual Kwhr Use	Dairy Pres	Dairy Pot.	Livestock Pres	Livestock Pot.	Mixed Pres	Mixed Pot.
Hay Curing	3,000	0	51	0	9	0	5
Milk Cooler	2,360	38	100	0	0	7	9
Feed Grinding-Auto.	1,580	0	43	3	30	0	4
Heat Lamp-Brooding	1,250	24	53	24	71	15	41
Dairy Hot Water	1,100	76	98	0	0	7	11
Barn Cleaner	912	5	15	0	0	0	7
Silo Unloader	912	5	29	0	16	3	19

Single-Phase Service . . . The entire area is served with single-phase distribution. The applicable regulations permit motors of 7½ hp, repulsion induction, and a small number of this rating have been employed for feed grinding. Most of the feed grinding has been done by mills of 10 and 15 hp with belt take-off from tractors. Research at the University of Illinois, Agricultural Experimental Station has been in the direction of motors of not larger than five hp on automatic grinders operating over longer periods.

Potential Market . . . It is anticipated that a ceiling for domestic use will be in the order of 9,000 kwhr per year exclusive of any space heating. Of those customers having the highest order of consumption, above 25,000 kwhr, about 30% of the total was devoted to domestic use. The potential market is much greater with the dairy and mixed groups than it is with the livestock group. Table IV shows the near-future potential market per farm, the increase in kwhr use being indicated for domestic and farm chores.

Present and potential saturations of major farm chore appliances by type of farm are shown in Table V. These are appliances whose annual kwhr use is 900 or more. There are also some 20 smaller appliances whose use is less than 900 kwhr per year.

OUTDOOR CONSTRUCTION of three identical hydro plants saved about $200,000. Building at left of unit houses control for other plants, small shop, office and auxiliaries. Camp at right will be replaced by homes for plant crew

Outdoor Construction + Identical

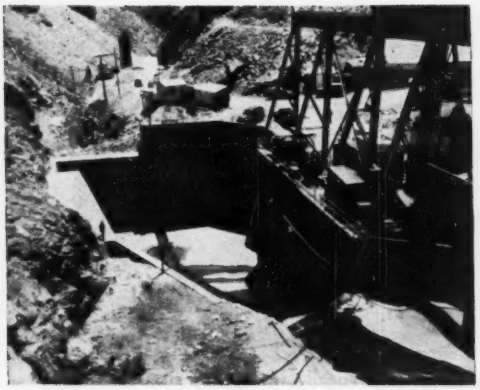
Three single-unit plants located for equal net effective heads use identical units, common set of spares. Remote control of two from the third cuts operating expense by half

Emphasis on economy of construction and operation led Los Angeles Department of Water and Power to design and build three 37,500-kva hydro plants with outdoor construction and provide for remote control of two from the third by supervisory control. Savings on the building enclosures alone amounted to about $200,000. Supervisory control will reduce operating personnel to about half the number required for conventional operation of the three plants.

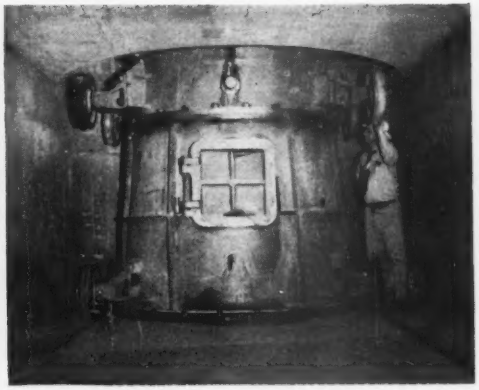
A further substantial saving was realized by taking advantage of the topography to locate the three plants in series so they operate with equal net effective heads. This permitted use of identical units and equipment throughout, requiring only one set of spares, and simplifying details of plant design.

Physical Layout . . . The three plants are located in the 18-mile gorge of the Owens River east of the Sierras, about 260 miles north of Los Angeles. Careful investigation of several different possible combinations resulted in the decision to build three identical single unit plants in series to utilize the existing 2,375-ft static head of the river.

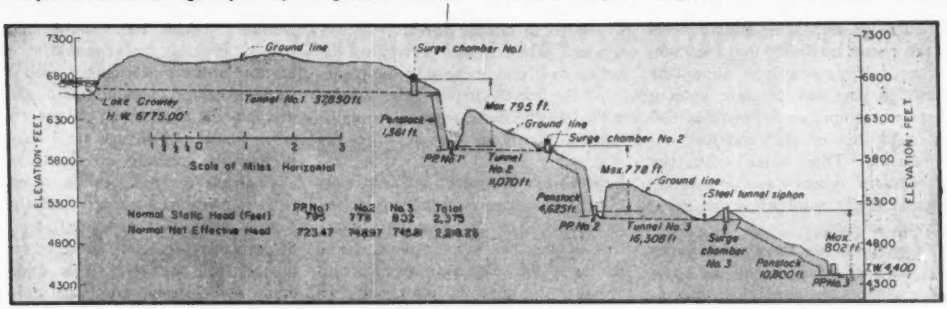
To fit three plants with approximately equal operating heads into the gorge required radically different lengths of tunnels and penstocks, because of the non-uniform drop of the river. This results in different losses of head for the three plants at any given load. To provide the best compromise, the plants were located and the depth of their foundations adjusted so the net effective heads at full rated load would be as near equal as possible.



SMALL TAILBAY of middle plant is forebay for lower plant; can supply the lower unit for only 2 min. Series operation of three plants with no storage requires special governor controls



MOVEABLE SECTIONS of draft tube carry their own wheels. Runner can be dropped for maintenance or inspection. This end of track is in a pit which provides an indoor maintenance area



OWENS RIVER GORGE in profile shows how three identical hydro plants were placed in series. Plants are located so that normal net effective heads are within about 3% of each other. Biggest variation, between plants 1 and 3, is only 25.5 ft

Equipment = Lower Hydro Costs

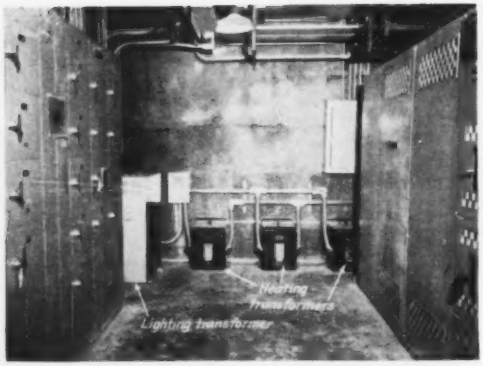
With equal operating heads and equal flow of water, the plants could be equipped with identical turbines, generators, and auxiliary equipment. General layout was the same; equipment is all interchangeable; and only one set of spare parts is required for all three plants.

Building, Equipment Economies . . . Use of outdoor metalclad switchgear and a weatherproof enclosure, which fits over the single generating unit at each plant, leaves only control equipment and auxiliaries to be housed in a building. The lowest of the three plants has a building large enough to house supervisory equipment for controlling the other two, plus office quarters and a small shop. Space is provided in the concrete turbine foundations for removing a section of the turbine draft tube to lower the runner. This space is also available through a hatchway for bringing a transformer or other medium-sized pieces of equipment in out of the weather for maintenance or repair.

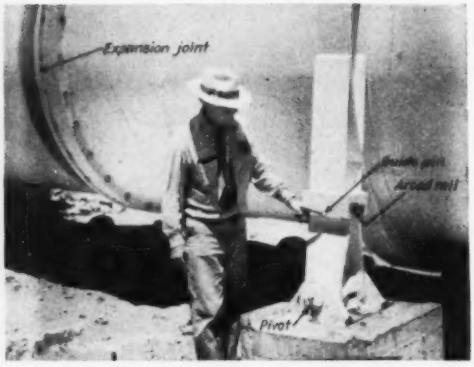
As a further economy, the 37,500-kva, 400-rpm generators were ordered with a rated voltage of 11.5 kv, which cost 2% less than 13.8 kv. Because charging currents for the 260-mile, 220-kv single circuit line to Los Angeles are quite high (46,800 kva at 70% voltage), the machines were ordered on the basis of operating two in parallel to charge the line. On this basis a short circuit ratio of 1.88 was adequate, compared to 3.76 if one machine was used, and an additional 40% in machine cost was saved.

The line will normally be energized by bringing two generators in parallel up to 50% voltage, closing the breaker connecting them to the line, synchronizing at the receiving station in Los Angeles, and bringing the load up as the sending end voltage is increased.

Plant Operation . . . As a result of a long series of dry years in the area, the plants will be operated initially to the over-all water requirements of the Department, which has long operated the Crowley Lake reservoir as part of the Los Angeles water system. Considerable storage above and below the plants will permit the flow of water under normal conditions to be



ELECTRIC HEATING is provided in all three plants. Three 25-kva dry-type transformers at the motor control panel and 11.5-kv switchboard supply lower plant. Transite panels mounted on angle iron framework kept plaster work to a minimum



DOUBLE-ROTATING rocker arms at 60-ft intervals are designed for total penstock movement of 9 in. from —30 to 150 F. Lower piece pivots on concrete base; upper piece dovetails loosely on a slightly arced rail. Pin serves as guide

varied to meet peaking requirements of the system up to 115,000 kw. Synchronous bypass valves allow the plants to pass any constant amount of water required up to the rated 690 cfs, regardless of electrical load requirements. These same valves act as pressure relief valves protecting against surges resulting from rapid changes in load.

Operation of the three plants in series with very small forebay and afterbay capacities requires close coordination of flow through individual plants. The afterbay at the middle plant, for example, has enough capacity to supply the lower unit only about 2 min at full load. The unequal change in net effective heads at different loads because of the unequal tunnel and penstock lengths is only a secondary consideration, since maintaining equal flow is more important than division of load between the plants.

To maintain equal flow through the three plants in series, venturi sections in the penstocks above the plants measure the flow in each line. This information is automatically transmitted to the control plant where it is compared with a standard adjusted for desired flow. Any difference in the measured flow causes a correcting signal to be sent to the governor of the plant concerned. The governor in turn adjusts the wicket gate setting for the desired flow.

As a secondary correction, tailbay level is measured on the upper two plants. As the level drifts up or down a signal is fed into the same circuits as above to change the flow as required. The control equipment is set up so if one or more of the plants is off the line the bypass valve is controlled in the same manner to maintain constant flow.

Supervisory Control . . . Chief function of the supervisory control is remote starting, stopping, and load control of the two upper plants from the lower one. The supervisory board provides the controls listed, and the pilot circuits also provide telemetering, indication, and alarms, as shown.

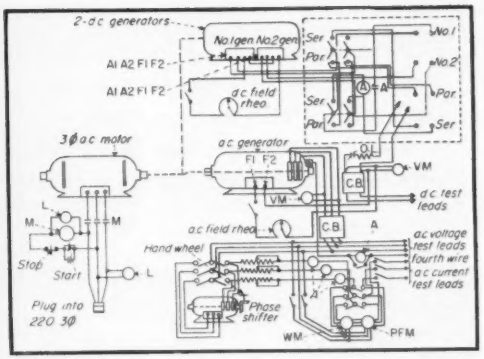
The master start and stop switch incorporates an automatic synchronization provision for the two upper plants. It starts the governor in operation, opens wicket gates to roll the turbine, brings the unit up to speed and puts the governor in control, then when phase and voltage are matched it closes the generator circuit breaker.

Channels for the supervisory control are provided by a polyvinol chloride covered shielded cable carrying 50 pairs of polyethelene-insulated conductors from the lower to the middle plant, and 26 pairs from the middle plant to the upper plant. The cable is suspended from poles of a 34.5-kv power line of the Department's which parallels the gorge.

"Umbrella" Stops Substation Flashovers

CORRUGATED ASBESTOS BUILDING over substation eliminated flashovers by keeping out fog and drizzle. Iowa-Illinois Gas & Electric Co found this $85,000 structure to be the most economical means of solving the problem of eliminating repeated flashovers. The building is 150 ft long, 105 ft wide and 53 ft high

PORTABLE TEST WAGON makes possible assembly line testing of switchgear resulting in great saving of time and of expense



NECESSARY TEST EQUIPMENT contained in portable wagon includes watt-hour meters, power-factor meters, phase shifter

Test Switchgear On Assembly Line

CHARLES SANCOMB, General Foreman, Test Floor, and GEORGE ORDANEFF
Allis-Chalmers Mfg Co, West Allis, Wisconsin

To speed test work on switchgear and switchboards a versatile test unit on wheels has been built that permits tests to be made right on the switchgear assembly floor. Formerly, all tests had to be made on the test floor, tying up badly needed space. Also small sections of circuits, critical relays, and meters were tested section-by-section or piece-by-piece. Now, complete circuits of entire lineups of switchgear may be tested simultaneously and more economically.

Errors in wiring or diagrams can be found quickly when phasing out the complete circuit of a lineup. Directional meters, instruments, or relays with reversed leads are quickly caught. Potential transformers and current transformer secondary circuits are also checked.

Unit Specially Built . . . Since no test equipment of similar design could be readily purchased to handle the wide variety of test work, the unit was specially built. Its source of ac supply is a modified 6½-kw, 240-v, 60-cycle three-phase ac generator driven by a 220-v, 15-hp induction motor. Since most of the switchgear circuits tested are three-phase, four-wire systems, it was necessary that a fourth wire be added to the ac generator circuit.

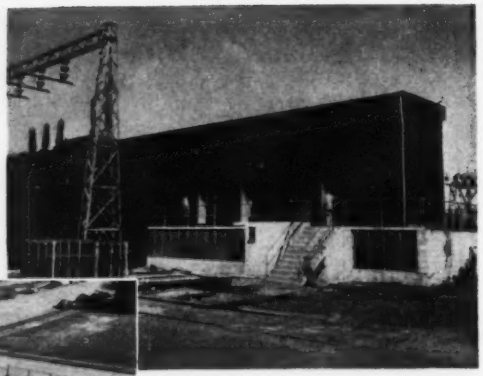
Current to the wattmeter can be varied, while voltage on the potential coils can be held constant. This is accomplished by having two sets of test leads, one current, the other potential, and 50-ohm adjustable resistors connected only in the current lead circuit. Ammeters are connected in the current leads. A wattmeter, a voltmeter and a power factor meter are also connected in the circuit. With this arrangement, the accuracy of instruments being tested can be determined by comparing them with the standard test meters. Both potential and current leads are color coded so that correct polarity is obtained at all times.

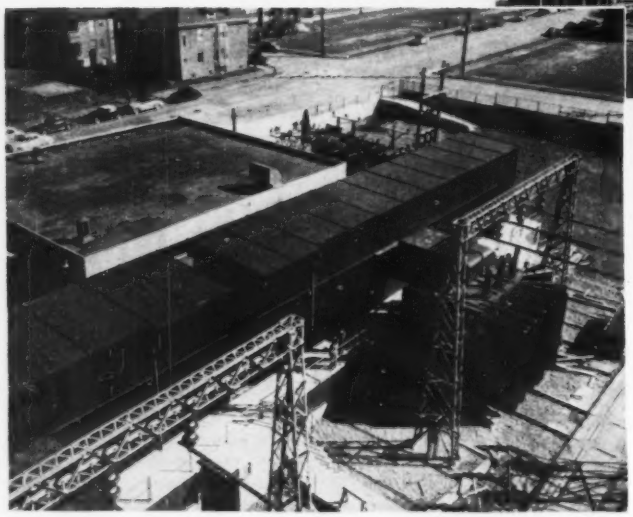
DC Testing . . . To produce dc voltage for the ac generator's field excitation and for testing all other dc equipment, two inverters having a dc motor connected by a coupling to an ac generator are used. By removing the ac generator from one and replacing it with the dc motor of the other, two dc motors were converted to two dc generators by driving the two coupled dc motors with the same 15-hp motor which also drives the ac generator. By means of a switch arrangement, the dc generators can be used separately, in parallel or in series. Voltages up to 370-v dc can be obtained. In parallel, the machines can produce 10 kw at 125-v dc. They also are utilized to excite the field of the ac generator.

Testing Overcurrent Relays . . . For accurate testing of directional overcurrent relays, a two-hp wound rotor induction motor was converted to a phase shifter and a three-pole, double-throw switch was cut in the circuit. One side of the switch was connected to the current leads and the other to the three stator leads of the two-hp wound rotor induction motor. The leads from the wound rotor were then returned to the current test leads. By merely switching one way or the other, the phase shifter can be inserted in the circuit or removed to make it possible to connect directly to the current leads. A gear and wheel turn the rotor of the phase shifter to shift the angle between the voltage and current either in a lead or in a lag direction. Directional relays can thus be tested under fault conditions.

Test unit can also be used to test auxiliary devices such as machine temperature relays, rectifiers, etc.

First installation of 34.5-kv outdoor cubicle switchgear costs less than conventional indoor, takes less space than outdoor rack construction, may be the answer for substations in downtown areas





MAXIMUM SPACE ECONOMY for transformer secondary switchgear is provided by this weatherproof enclosed outdoor cubicle switchgear in Seattle City Light's new 115/26-kv, 100,000-kva Broad Street substation. Space required is about one quarter of outdoor rack construction; cost is considerably less than conventional indoor station construction. Building at left houses switchboard with controls and relaying, two 1,500-kw rectifiers and dc switchgear which feed local transit system

CONCRETE PEDESTAL construction with translucent corrugated panels houses isolated phase bus connecting cubicles above, provides room for bottom exit of low pressure gas-filled feeder cables. The well lighted gallery also houses air compressors and storage tanks

Enclosed

H. V. STRANDBERG, Project Engineer
L. E. WHEELER, Associate Electrical Engineer
Seattle City Light, Seattle, Washington

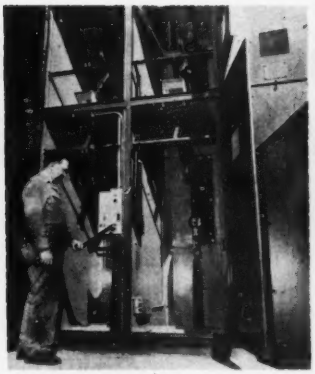
Outdoor cubicle switchgear in weatherproof enclosures used in Seattle City Light's new Broad Street substation requires only one quarter the space of conventional outdoor rack construction. This saving of costly space for a 115/26-kv, 100,000-kva substation in downtown Seattle was achieved for only a slight premium over outdoor construction. Additional cost attributable to the factory-assembled weatherproof enclosure is estimated to be only about half the cost of a building for conventional indoor construction. Additional advantages of the enclosed construction are greater safety for equipment and personnel, higher reliability, easier maintenance, and better appearance.

Much Equipment, Little Space . . . Space economy was an absolute necessity in planning the Broad Street station because of its location adjacent to the business district of downtown Seattle. The usual obstacles of high cost and local objection to construction of a substation were aggravated by physical congestion which severely limited the possible sites. Although the site chosen provided a strategic source location for the 26-kv feeder circuits serving the downtown area, its small irregular area bounded by four busy streets permitted absolutely no space leeway. Use of the space-saving enclosed switchgear would therefore have been justified even at a considerable premium over outdoor construction.

Rapid load growth in the area served by the station will require installation of a third transformer and switchgear equipment of the same capacity almost immediately. This will bring the station up to its ultimate capacity of 150,000 kva, and further load growth will be taken by another downtown station at a new site.

Each of the first two equipments now installed provides in an area roughly 15 x 90 ft complete switchgear for the secondary of a 115/26-kv, 50/62.5-kva transformer. This includes transformer secondary disconnects and air circuit breaker, six feeder cubicles, a bus potential transformer cubicle, and three current limiting bus tie reactors plus disconnects and breakers. Reactor tie and feeder circuits leave the cubicle structure

MINUS ARC CHUTES, individual poles of the three-pole pneumatically-operated compressed air breakers are easily accessible for adjustment or maintenance. Gases formed on heavy interruptions vent into an expansion chamber above the breaker in breaker compartment



VISIBLE CIRCUIT ISOLATION for breakers and feeders by hand-operated disconnects, plus complete mechanical interlocking insure maximum safety for men and equipment. Disconnect is normally crank-operated with all compartment doors closed during operation

COMPLETELY SEPARATED by metal barriers, primary conductors offer maximum reliability. Individual compartments are so nearly gas tight that gasses cannot pass from one to another without complete deionization, minimizing damage hazards under fault conditions

Outdoor Switchgear Uses 75% Less Space

through the floor, which is elevated on a concrete pedestal structure as shown. This structure houses isolated phase bus compartments, cable raceways, compressors and storage tanks for the pneumatically-operated compressed air circuit breakers, and other miscellaneous equipment. Some specific features of the switchgear equipment are shown in the accompanying photographs.

Safety Features . . . Design of the switchgear incorporates several features which contribute materially to safety, as well as reliability and ease of maintenance. Use of compressed air circuit breakers has reduced oil hazards to a minimum—the only oil used is a small amount in the potential transformers. With the minor exception of a stud in the potential transformer compartment which is exposed when the transformer is locked in the disconnected position, there are no exposed live parts any place in the equipment. A system of mechanical and electrical interlocks prevents access to any part of the equipment until it has been disconnected and grounded.

Maximum reliability in operation is assured by isolated phase construction, liberal clearances, and high impulse strength. Metal barriers between phases in all compartments equipped with primary conductors are carried through from transformer secondary bus to feeder terminal compartment. Individual compartments are sufficiently gas-tight to prevent passage of gasses from one compartment to another before complete deionization. Bus and disconnect switch enclosures are also gas tight, but circuit breaker compartments are vented. Minimum clearance of 13 in. between uninsulated live parts and ground insures high impulse strength, and the equipment, which is rated 34.5 kv, is capable of withstanding a 200-kv full wave impulse test.

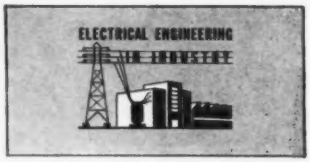
"HORSE TAILS" of iron laminations line the bus tie current limiting reactor compartments to provide a low reluctance path for magnetic flux and prevent heating in the metal enclosure. Reactors will be used for bus tie when third unit is installed

With an absolute minimum of exposure, plus almost air-tight construction, the equipment in the weatherproof enclosure is expected to require a minimum of maintenance. Hinged and removable panels used throughout provide ready access to all parts of the equipment. Should an emergency require some repair work during inclement weather, a temporary tarpaulin can easily be rigged to protect the exposed cubicle.

An additional advantage of the enclosed construction is near-perfect protection against rodents and birds, as well as industrial or atmospheric contamination, afforded equipment.

Service Continuity of Secondary Network Natural for Soap Plant

Secondary network provides maximum service continuity plus greater flexibility and maximum benefit from good plant load diversity in serving new Lever Bros plant



W. H. HAHN, Engineering Dept, Bechtel Corp, Los Angeles

ASSURED service continuity, as well as greatest benefit from load diversity and interchangeability of equipment, influenced the Bechtel Corp to select a secondary network distribution system for the new 25 million dollar soap, detergent, and edible oil plant they designed and built for Lever Brothers Co in Los Angeles. For a premium of only 2% more than the cost of the least expensive system considered adequate, the plant is assured continuity of service without even a momentary interruption in event of system trouble. This feature is of paramount importance in soap, detergent, and edible oil processing, where many processes are continuous and even a short interruption may be very costly.

Three Possibilities. . . . Before choosing the type of electrical distribution system best suited to the plant, Bechtel's engineering department narrowed the choice to three possibilities:

A—Secondary network of six unit substations with a total capacity of 6,000 kva.

B—Primary selective radial system of seven units, total capacity 7,500 kva.

C—Secondary selective radial system with seven double-ended units and total capacity of 8,000 kva. The greater transformer capacity for B and C is required because such units normally operate individually and cannot take advantage of the good load diversity of this type plant.

Approximate installed costs for the three systems on this basis were within a range of 5%. Possibility of prolonged shutdown in case of trouble on B, the primary selective radial system, ruled it out, even though it was the least expensive. Momentary interruptions of from 3 to 5 seconds before service would be automatically restored in case of trouble on C, would have required time-delay relays to prevent no-voltage release of motor starters, leaving A the obvious choice for service continuity. In addition to assured service continuity, greater flexibility of load shifting, better diversity, lower maintenance because of standardization of duplicate units, and better voltage regulation all favored the secondary network system, and it was chosen despite a 2% cost differential over C. The system was designed with the cooperation of the Westinghouse Electric Corp, which supplied the electrical equipment.

The system chosen, which is designed to provide uninterrupted service to all plant buildings regardless of failure of any part of the system, is essentially a 4,160-v primary radial and 460-v secondary network system of six unit substations, each with a 1,000-kva dry-type transformer. Two separate incoming sources serve the main 4,160-v switchboard on a preferred and emergency basis, with automatic throwover in the event of power failure on the preferred source.

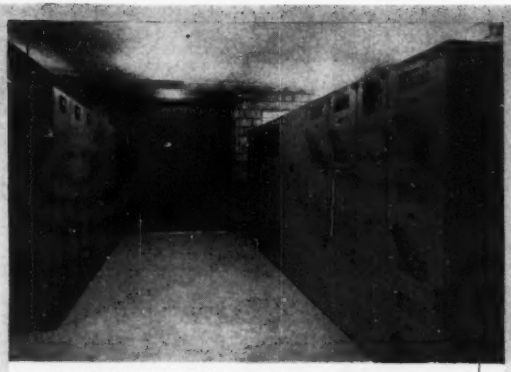
All six unit substations are similar in construction and have interchangeable parts, making for lower maintenance. Transformer secondaries are connected to individual feeder circuits at each location, and in addition all six secondaries are connected in a 480-v ring. Thus the connected loads are common to the system and all transformers feed all loads.

Good Diversity. . . . Total connected load in the plant is approximately 7,800 hp of motor load and 1,900 kw of lighting and other miscellaneous loads. Studies of plant equipment and operations and data from other similar plants indicate that the 15 minute maximum demand will be about 4,500 kva, power factor 85-90%.

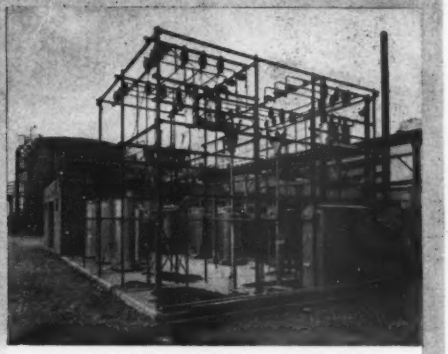
For addition of new loads the secondary network also offers excellent flexibility compared with separate and isolated unit substations. With the conventional system, addition of any new load must be considered in relation to load already carried by a particular unit. With the network system, any new load that is added anywhere on the system is shared by all of the unit substations collectively. Assured service continuity of the network system also eliminates any need to consider an emergency generator installation.

Design of the distribution system will permit addition of two future substations. The transformer units also have provision for future addition of forced air cooling to increase capacity of each transformer by some 250 kva. Ultimate capacity of the system thus is eight 1,250-kva units, a total of 10,000 kva.

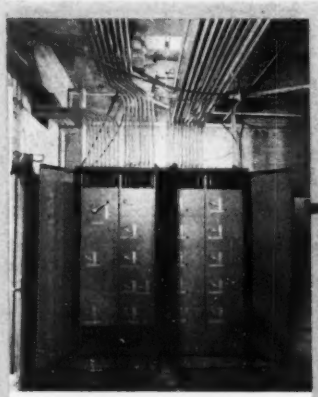
High Impedance Transformer. . . . Ordinarily one of the objectionable features of such a system is the extremely high short circuit currents resulting from connecting the transformer secondaries together. In this case the high interrupting duty was avoided by use of transformers with 10% impedance instead of the normal 5%. Higher impedance limits short circuit currents to less than 50,000 amperes for the system, based on the ultimate design of eight units. This permits the use of standard size circuit breakers rated 50,000-amp interrupting duty. Voltage regulation is excellent, even so; starting a 200-hp



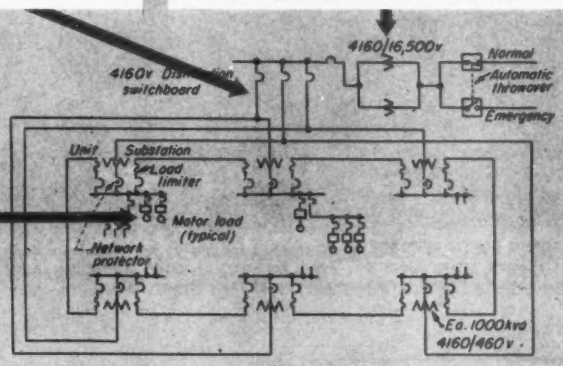
ULTRA-RELIABLE DISTRIBUTION of power starts with incoming switchgear (left) and typical unit substation (right). Secondary of 1,000-kva dry-type transformer connects with five other units in secondary network system, assuring service continuity. Unit equipment includes primary manual load break switch, network protector, two sets of load limiters, watthour meter, and distribution section with feeder breakers



DUAL PRIMARY FEEDERS with automatic throwover in case of failure of preferred source supply power for the six 1,000-kva unit substations which serve the $25 million plant. Incoming switchgear, one unit substation are housed in building at rear of this enclosure. Difference in cost of indoor and outdoor gear was enough to pay for the 25 x 30 ft. building.



WEATHERPROOF ENCLOSURE of motor control centers solves the problem of exposure during daily operating and hosing down. Standard interchangeable units simplify and cut the cost of plant maintenance on this network system

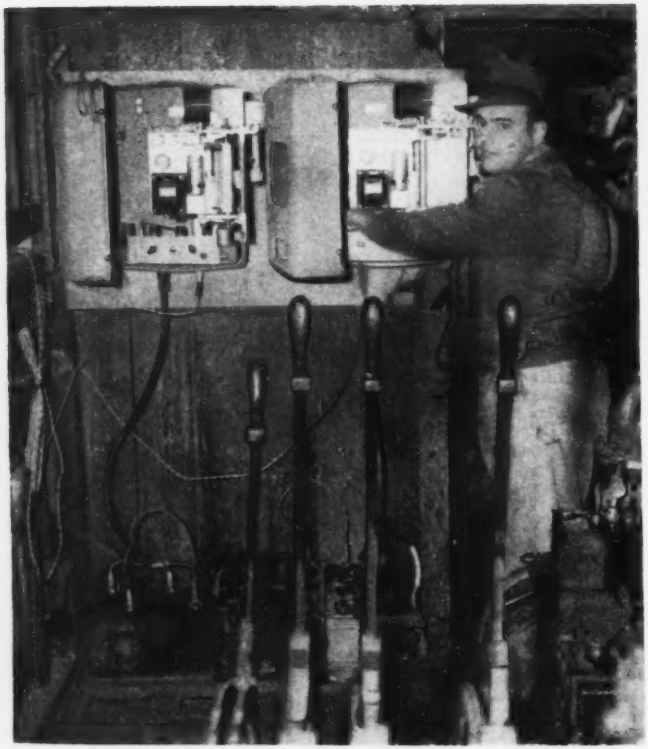


BEST POSSIBLE SERVICE CONTINUITY was prime objective of this primary radial and secondary network system used in the plant. Utility supplies two separate sources, stepping down from 16,500 to 4,160 v. Primaries of the six 1,000-kva unit substations are two 250-mcm rubber-insulated cables. Three 350-mcm rubber-insulated cables connect the six transformer secondaries in a 480-volt ring

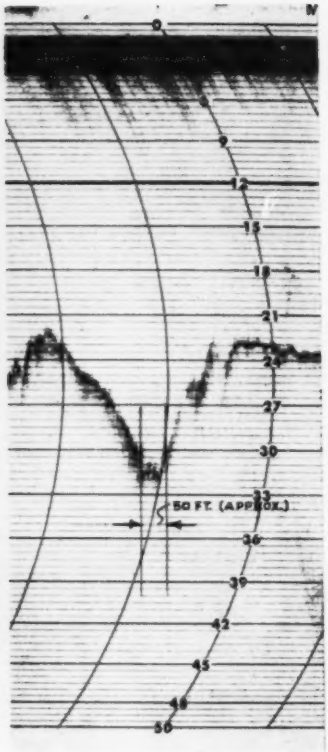
motor across the line results in a voltage variation of only about 3%.

Network protectors on each of the two secondary network connections at each transformer isolate any trouble that may occur by automatically disconnecting the high voltage feeder, the transformer, or tie circuit in the secondary network system, all without interruption of the power service. Design of the unit substations permits removal of any of the operating equipment items for maintenance without shutting down the system.

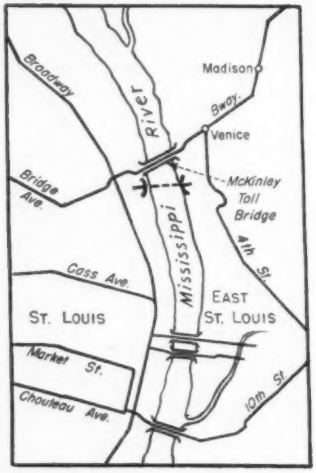
Use of dry-type air cooled transformers in the unit substations allows them to be located anywhere in the plant without regard to fire hazard. In addition to the substation equipment mentioned in the accompanying illustration, one of the substations is equipped with ground detector meters to warn of any ground faults which may develop anywhere on the system. The main switchboard for the system includes provision for future power factor meter with remote indication. The remote meter will be located in the steam boiler house where the operator can adjust operation of synchronous motors driving air and refrigeration equipment to obtain the best possible power factor.



ELECTRONIC DEPTH RECORDERS are checked by project engineer, Louis Jantzen, at start of cable laying operation. Depth recorders produced instantaneous indications of trench depth and location, as shown by the chart at right



TRENCH LOCATION was determined with recording depth meter which provided crew with continuous map



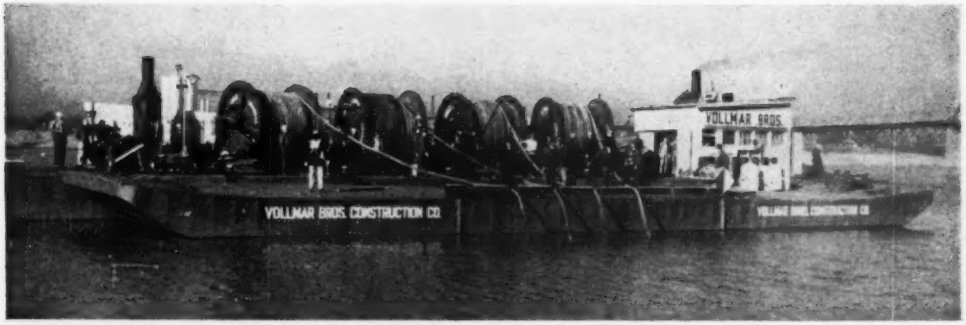
CABLE WAS LAID across Mississippi below McKinley Bridge, St. Louis

Electronic Depth Meters

Recording meters provide continuous depth chart to guide trenching and cable laying operations as four 33-kv, 20,000-kva, armored cables are installed

JOSEPH E. VOLLMAR, JR
Vollmar Bros Construction Co
St. Louis

Electronic depth recorders which provided crews with continuous map simplified trench digging and cable laying in installation of four 33-kv cables across the Mississippi River below the McKinley Bridge at St. Louis. The cables are of the armored submarine type and have normal ratings of 20,000 kw each, with emergency ratings of 30,000 kw. They were installed to provide additional capacity from the Cahokia and Venice plants, on the



CABLE LAYING BARGE with four reels of cable leaves Illinois shore. Cables from anchors upstream and from stationary engines at either end of barge to shore downstream guided barge as it pulled itself and the pay-off barge across the river. Cables in foreground were pulled from reels through trench to distribution manhole before the trip began

CABLE FOOTAGE is called to transit men on bank by engineer with electric megaphone. Wheel riding cable measures footage. Man in foreground is putting identifying tags on cable

CABLE FOREMAN signals brakeman on reels to keep correct tension. Project engineer signals transit men to coordinate location shots. McKinley Bridge can be seen in background

Aid Cable Laying Across Mississippi

east side of the river, to the city of St. Louis.

Cables were spaced 10 ft apart and the south cable was only 30 ft away from the north cable of another group that was already in operation. Because of this, special care was required in locating and digging the trench and in laying the cable. Large, easily identified targets were set up on both sides of the river and a transit man was kept on duty at all times to see that dredges did not enter the danger area.

Corps of Engineers requirements were that the cable be laid at a depth of minus 20.5 ft on gauge at St. Louis City datum. To meet this requirement, a cut reaching a maximum depth of 22 ft and a minimum of seven ft was required. The trench was 40 ft wide at the bottom and a total of 80,000 cu yd was excavated.

Dredging was started the first week of November when the river was at its low stage and ice free. Since the river has a sand bottom at that point, a sudden rise of as much as four ft would cause shifting of the bottom and filling of the trench which made it highly desirable to avoid any delay between start of dredging operations and completing the cable laying. Principal dredging was with an 18-in., straight suction, hydraulic dredge, powered by a 600 hp diesel engine. A second dredge with cutter head section was used for final clean-up of the trench. Dredging required 20 calendar days during which work progressed 24 hr a day, seven days a week.

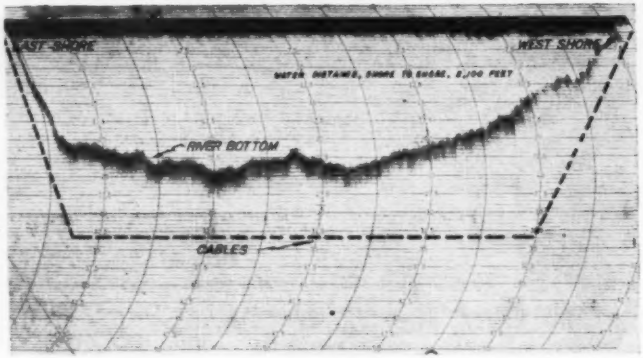
While clean-up of the trench was being completed, a barge with the four reels of cable was moved into position on the east shore of the river

WITH REELS ALMOST EMPTY barge arrives at Missouri shore. Remaining cable was pulled to distribution manhole. Venice plant of Union Electric Co of Missouri is across river

AT MISSOURI SHORE cable remaining on reels was removed and laid in figure-eight on barge deck to prevent it from kinking when it was pulled up bank to distribution manhole

and cables were pulled to the distribution manhole. Upon completion of the dredging the trench was inspected with an electronic recording depth meter and was approved by the Corps of Engineers.

The cable laying barge was kept on a true course by ¾ in. cables extending from hoisting engines on the barge deck to heavy anchors upstream and downstream from the trench. The trench was 40 ft. wide at the bottom and sides sloped 1 on 10 upstream and 1 on 5 downstream. Since four cables were to be laid 10 ft apart it was necessary to know the exact location of the trench. This information was readily available with the electronic depth recorder which located upstream and downstream toes of the sloping sides and also the positions at which the cables fell into the trench.

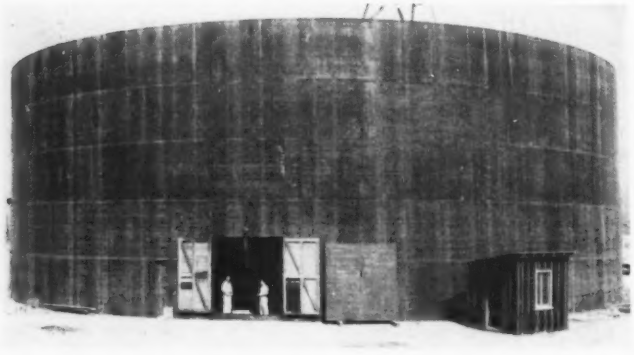


DEPTH OF RIVER at all points was recorded by electronic depth meter. Location of cables with reference to river bottom was marked on continuous chart

These depth recorders produced highly accurate soundings instantaneously on a continuously recording chart.

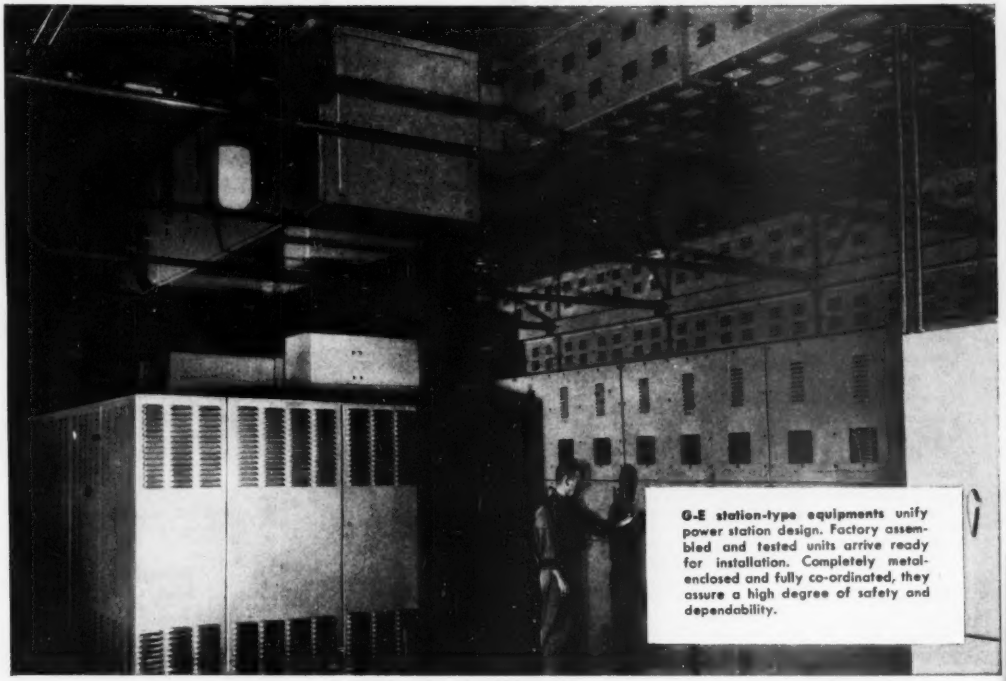
The cable laying operation required only 3 hr 55 min from the east bank until landing on the west bank.

Oil Storage Tank is Temporary Warehouse



An empty oil storage tank has been put to use as a temporary warehouse during the construction of California Electric Power Co's Highgrove generating station near Riverside in southern California. Completion of the tank came several months before it was needed to store oil. The tank was converted into a storage building by the removal of a rectangular section near the base and the installation of wooden doors.

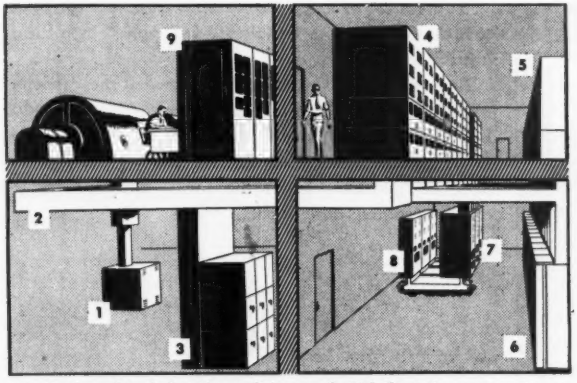
STORAGE TANK became a temporary warehouse by removal of rectangular section and installation of doors



G-E station-type equipments unify power station design. Factory assembled and tested units arrive ready for installation. Completely metal-enclosed and fully co-ordinated, they assure a high degree of safety and dependability.

FORMULA FOR UNIFIED POWER STATION DESIGN . . .

Complete project planning with packaged equipment



Artist's view of typical station switchgear, of which the various components are: (1) Neutral grounding breaker and resistor; (2) Generator buses; (3) Generator surge and potential transformers; (4) Generator and feeder cubicles; (5) Feeder transfer bus; (6) Feeder cable entrance units; (7) Synchronizing reactors; (8) Synchronizing bus; (9) Duplex control board.

G-E station-type equipments provide the modern method for getting unified power station design. These standardized units readily combine into a compact, integrated system matched to your requirements. Factory assembled and tested, they provide a degree of over-all co-ordination difficult to achieve in any other way.

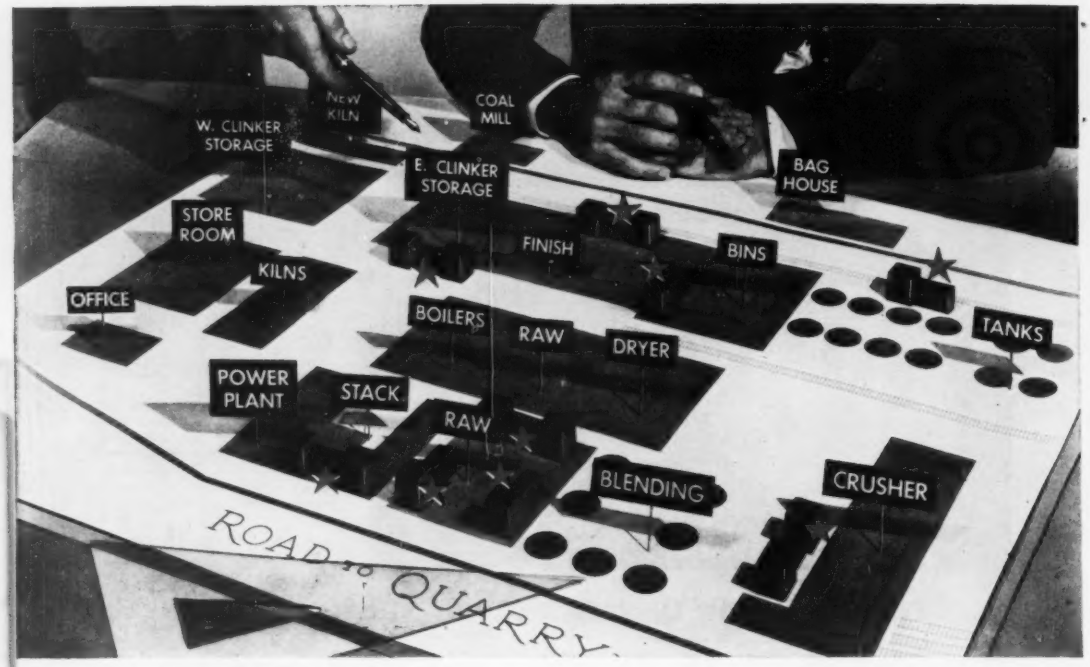
Standardized "packaged" units include circuit breakers, associated switching equipments and interconnecting buses. Each has been given the large investment in design time and high degree of design refinement warranted by repetitive manufacture. All are completely metal enclosed and fully co-ordinated to assure greater safety and dependability.

For complete information concerning the many advantages of G-E station-type equipments, see your local G-E sales representative, or write the General Electric Company, Schenectady 5, N. Y.

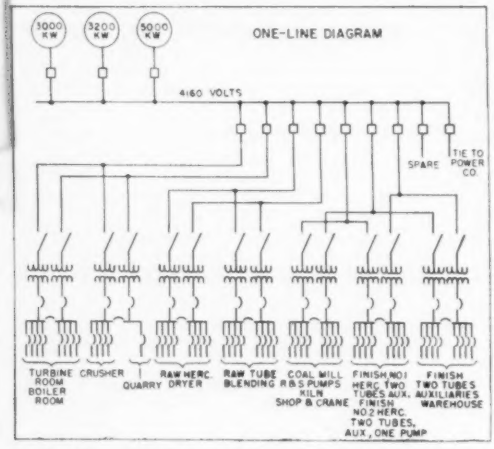
GENERAL ELECTRIC

BSS-28

Dewey Portland Cement Co. solves



Modernized System gives additional capacity

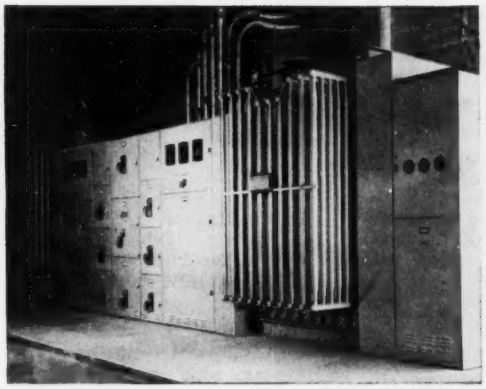


One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.

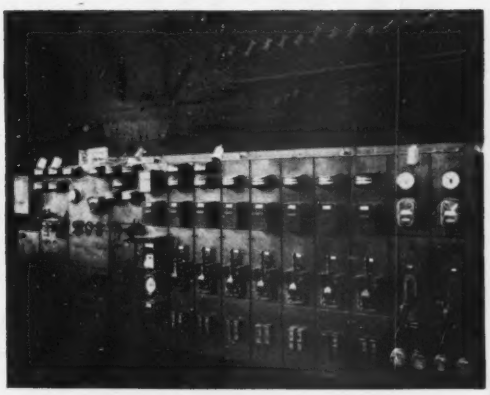
For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.

a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.



Old switchboard with exposed switches and conductors threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

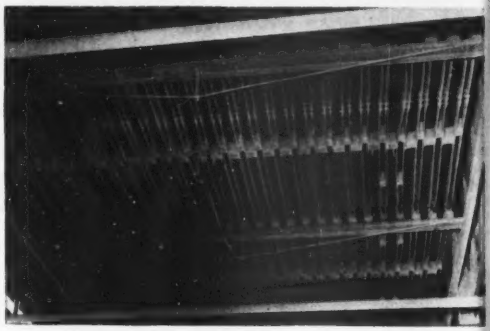
Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

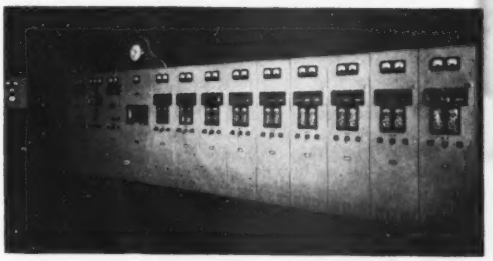
G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



¼" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.

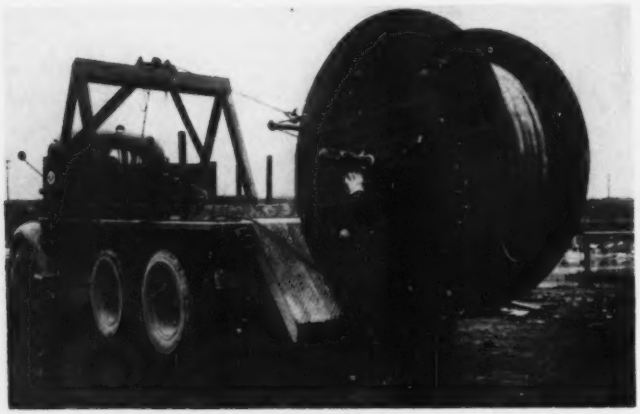


New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL ELECTRIC

321-81

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



LOADING AND UNLOADING is accomplished with equal ease whether or not reel is lagged. A-frame provides lifting height, axle eliminates need of winch line around reel, and sloping tail gate reduces pulling force required to load or unload. Weight and size of this reel permits use of small cable sling and single winch line

Load and Haul Unlagged Cable Reels

C. F. HERSCHBACH
Asst Transportation Supt
Commonwealth Edison Co Chicago, Ill.

Cable hauling trucks that load and unload all sizes of cable reels with equal ease, whether or not lagging is in place over the reel flanges, have added greatly to ease with which such unwieldy equipment is transported. Features of the new truck equipment are these:

1—Arrangement for attaching winch line to temporary axle slipped through arbor hole in center of reel.

2—Sloping steel tail gate that reduces pull required for loading reels and eases the drop when unloading.

3—An "A-frame" which provides sufficient lifting height above truck bed.

The truck is a six-wheel, dual-drive, cab-over-engine chassis, having a 160 in. wheel base and a gross vehicle weight of 38,000 lb, which allows a safe payload of 22,000 lb. The body is a flat-bed type with removable stakes. It is 16 ft long, including the two-ft sloping tail gate or ramp at the rear. This apron, inclines at an angle of approximately 45 deg.

On the forward part of the platform body, just back of the winch, is a steel "A-frame" with a free traveling sheave. The A-frame, capable of supporting a safe winch line load of 11 tons, is necessary to obtain sufficient lifting height above the truck bed, to permit loading of two unlagged reels of cable without causing damage to cable on the first reel after it is in place on the truck platform.

Reel handling equipment comprises a 30,000 lb capacity winch, driven by a power take-off from the truck transmission, 75 ft of $\frac{5}{8}$ in. wire rope on the winch drum, and two reel loading slings to handle all sizes of cable reels. A steel bar with fittings performs the function of a fixed axle when inserted through the hub of the cable reel to facilitate rolling the cable reel onto the body of the truck.

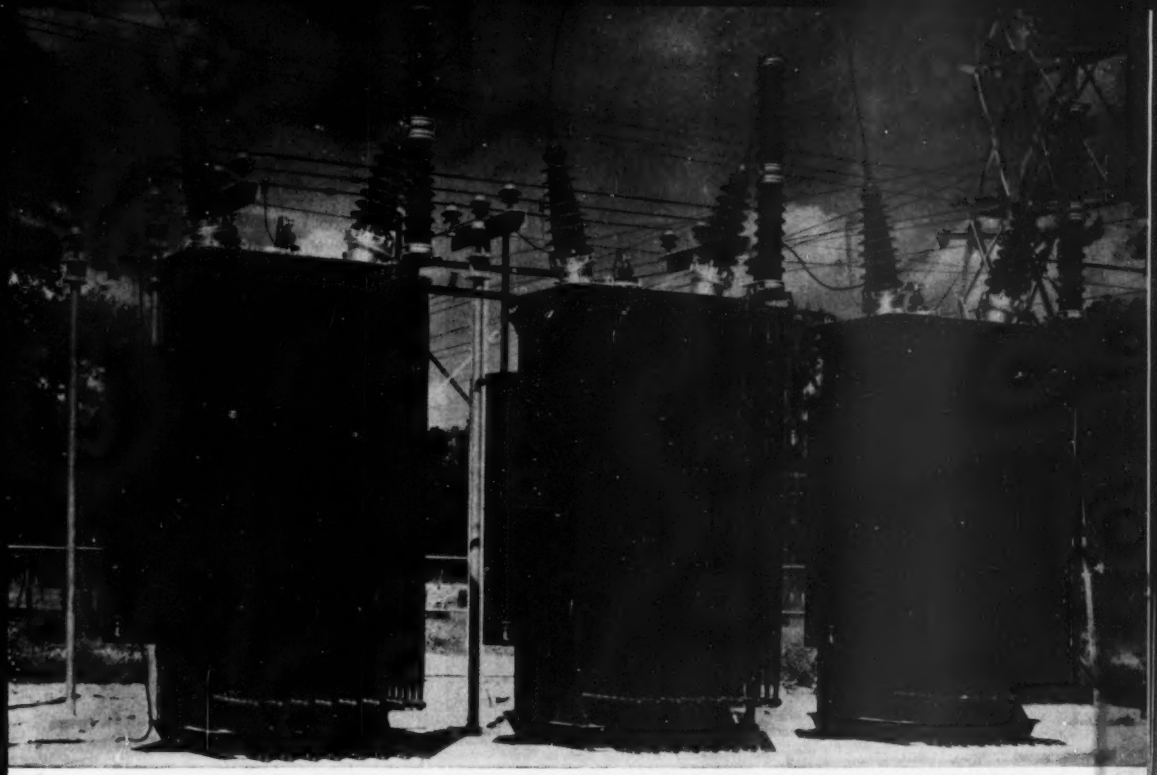
Bushing Current Transformers for Generator Save Space

C. C. STERRETT, AC Engineering
C. A. WOODS
Circuit Breaker Engineering
Westinghouse Electric Corp
East Pittsburgh, Pa.

Large 3-phase turbine generators require from 12 to 18 current transformers to energize differential and back-up relays, meters, and instruments. Bushing current transformers installed around new condenser bushings, and neutral connections installed in an aluminum enclosure eliminate the problem of finding space for equipment under hydrogen-cooled machines.

Bushing current transformers are especially suited where heavy current and strong, stray magnetic fields are encountered under short circuit conditions. Their toroidal construction prevents stray or leakage flux from impairing their accuracy. In this new application, transformers are mounted over condenser bushings to take advantage of the insulation inherent in termination of machine windings. Each transformer, embedded in a moisture-resistant, thermosetting compound, is enclosed in a cast-aluminum case that permits connecting any kind of bus on the line end. Secondary leads terminate in a compartment integral with this case.

The first of the three possible units on each bushing is installed adjacent to the external end of the bushing, so that any unused positions are between



THREE REPETITIVE-MANUFACTURE TRANSFORMERS installed at a substation of a large utility in southeast Texas. They are each rated 1000-kva, single-phase, 67,000 volts to 7620/13200Y. Cylindrical auxiliary tanks contain oil and an inert gas which excludes oxygen, preserves the insulating oil in main tanks.

Utility Saves 7 Weeks and $3054 on Six Transformers by Ordering RM

Lower prices and faster shipments have sold a Southeast Texas Utility on the RM* idea.

A recent specific order shows why: Six transformers were ordered for two important substations. Each was a single-phase, 1000-kva unit—step-down from 67,000 volts to 7620/13200 volts Y. The net price for one of these RM units was $5738, while the net price for a comparable nonstandard transformer was $6247. Total saving—because the utility purchased RM—was $3054, and what is equally important, shipment was made in 11 weeks, versus an average delivery at that time of 18 weeks on non-standard transformers of similar ratings.

Are you taking full advantage of RM? Available in single- and three-phase ratings, with or without load-ratio control and fan cooling, RM transformers are easy to apply to your system. For complete listings and application information, write for Bulletin GEC-479, *Apparatus Department, General Electric Co., Schenectady 5, N. Y.*

*RM stands for "Repetitive Manufacture." By using standardized construction methods, General Electric builds RM power transformers more economically—delivers them faster. RM designs are available in ratings 10,000 kva and below and up to 69-kv, with many optional features.

GENERAL ELECTRIC

CURRENT TRANSFORMER of bushing type is easily installed due to light weight and individual assembly. Its construction protects against moisture and vibration

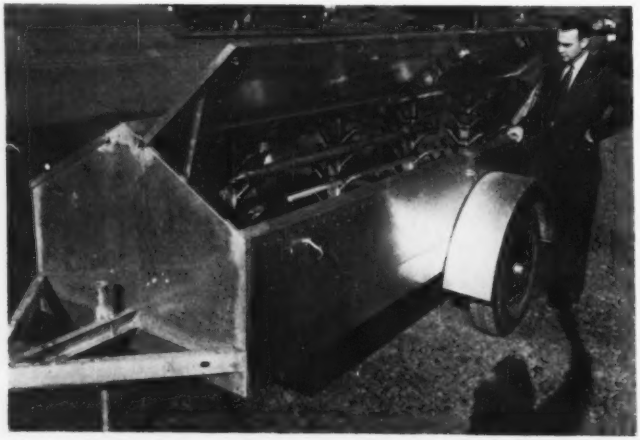
the first unit and the frame of the machine. This provides a symmetrical arrangement with smooth faces that makes it possible to connect isolated-phase bus or the aluminum-enclosed neutral without subjecting transformer core and windings to any mechanical strains.

A bushing can be removed from the assembly without disturbing generator rotor or end bearing brackets. A handling tool is available to facilitate installation or removal of larger size bushings.

Various standard ratios of bushing current transformers are listed in the table for each bushing size. To determine desired transformer ratio for generator metering and protection, multiply generator current rating for a hydrogen pressure of 0.5 psig by four-thirds. Then use the transformer with the next larger primary current rating, as listed under the appropriate bushing rating. This assures a transformer with a ratio great enough to handle larger currents obtained with increased hydrogen pressure.

With duplicate line and neutral bushing current transformers, maximum sensitivity is obtained on generator differential protective relaying. Possibility of incorrect tripping on through faults due to dc saturation is minimized. Further, characteristics of these transformers have been coordinated with those used in cubicle type switchgear. This coordination greatly simplifies the other relay applications. Linear coupler bushing transformers are available for bus relay protection.

Aluminum Trailer Tops for Tool Transport



ACCESSIBILITY of hot line tools is feature of Bonneville-built all aluminum trailer. Center rack mounts V-supports, which hold any size tool handle. Rubber bands cut from inner tube loop between supports, provide method for holding tools firmly

A F. WETSCH
Chief of Shops
Bonneville Power Administration
Portland, Ore.

Hot line tools are completely protected but easily accessible in a new all-aluminum trailer designed and built for maintenance and line construction crews by Bonneville Power Administration. Special V-supports on a center rack of the trailer accommodate a wide range of tool handle sizes and provide room for 18 tools in lengths up to 13 ft.

Two top-opening doors with automobile trunk lid type supports extend the full length and width of the trailer top for easy access to the center rack. Rubber bands cut from inner tubes provide a quick and flexible method for holding tools in place on the V-supports. The supports are covered

New cover band makes seal on G-E Spirakore* transformers even better

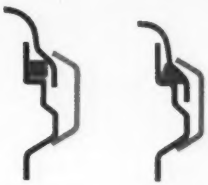
Spirakore transformers 100 kva and below are in production with the new clamp band which produces more uniform gasket pressure between cover and tank. Transformers resealed in the field can be as air-tight as those straight from the factory. *All* Spirakore transformers use Nitrile gaskets.

The cover on General Electric distribution transformers is now clamped against its Nitrile rubber gasket by a clamp band or ring. This produces uniform gasket pressure around the entire cover rim—results in even better sealing and resealing than ever before.

As in the past, breathing is completely stopped in G-E Spirakore transformers. Sealing is air-tight so that moisture-laden air can't be drawn into the tank to contaminate oil and shorten transformer life. Yet with this sealing, the new clamp actually improves accessibility. One bronze bolt holds the cover tightly in place. Loosen it, and band and cover lift right off. No adhesives to break—no surfaces to clean before resealing. You even re-use the same gasket.

Better sealing is only one of the reasons why Spirakore is the finest transformer you can buy. The full story is told in Bulletin GEA-5400. If you haven't a copy, write for one today. Address *General Electric Company, Schenectady 5, New York.*

*Registered trademark of the General Electric Company.



BEFORE TIGHTENING **AFTER TIGHTENING**

The brown represents the Nitrile rubber gasket which is of square cross section. The red is the new clamp band. When the band is tightened, the cover is drawn down against the gasket, compressing it and making an air-tight seal.

All openings—hand holes and bushings as well as cover—are sealed with Nitrile gaskets which are resistant to oil, age, sunlight and operating temperatures.

402-111

GENERAL ELECTRIC

LADDER SHELVES and power outlet are additional features which contribute to versatility. The enclosed shelves accommodate 14-ft ladders

with 3-in. belting to prevent chafing the tool handles.

Good Roadability

Roadability of the 15-ft, 1,000-lb trailer is excellent because of a torsion sprung axle which keeps it level and provides a low center of gravity even with a road clearance of 14½ in. Aluminum used throughout the rest of the trailer including the channels forming the frame, keeps the weight down without sacrificing strength. Durability of all-aluminum welded and riveted construction has been established by the first trailer built during 48 months of service in all kinds of weather and terrain.

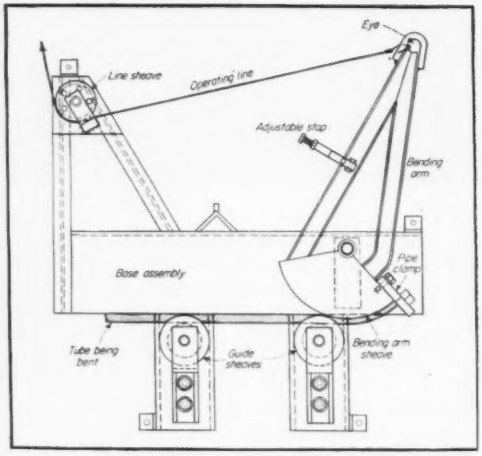
Trailers incorporate several additional features for added convenience and safety. Two enclosed shelves running the full length beneath the trailer box proper provide carrying space for two 14-ft ladders. A block permanently bolted in place fits between the topmost rungs to prevent the ladders from slipping out while the trailer is being moved from job to job.

Two sockets within the box for lamp bulbs or heaters are permanently wired to an outlet on the exterior of the trailer. An extension cord is provided to bring power from an external source to them to prevent any accumulation of moisture while the trailer is standing idle. Experience has indicated 150-w lamp bulbs provide sufficient heat for this purpose.

Cost of each of the four trailers fabricated in the Bonneville shops was approximately $1,000, including the torsion sprung axle.

Machine Cuts Tube Bending Time 60%

TUBE BENDING MACHINE is shown with its designer and builder, L. J. Fletcher, electrician of the St. Petersburg division of Florida Power Corp. This machine cuts bending time by 60% and can handle steel pipe up to 2 in. in diameter



Time involved in bending tubing has been cut 60% by Florida Power Corp through a tube bending machine designed and built by L. J. Fletcher of the St. Petersburg division. Field men have found the original device so useful that it was enlarged to handle 2-in. steel tubing. Three machines have been built, one for the division crew and one for each traveling crew.

The machine is of simple design and can be constructed at relatively low cost. The tube bender consists of base assembly, bending arm, pipe clamp, sheaves, shaft, and plates. In operation the bender must be secured to a rigid support.

To bend a pipe in the machine, the first step is to raise the adjustable stop (see illustration) and rotate bending arm so that eye travels toward line sheave. The bending arm is rotated in this direction until trailing edge of the bending arm sheave has cleared the guide sheave on the right by a sufficient amount for tube to be placed into grooves in guide sheaves. With adjustable stop still in the raised position, rotate bending arm assembly in the opposite direction until pipe clamp will fit over pipe. By taking up on the operating line, the bending arm assembly will rotate and the tube will bend, following the contour of groove in bending arm sheave. The adjustable stop can be adjusted to obtain a true 90-deg bend on all tubes. To remove formed tube from the bender, unhook the pipe clamp and rotate bending arm back to the starting position away from line sheave.

Low joint resistance... high resistance to corrosion

POWER CONNECTORS

Silver plated on all contact surfaces!

Silver on all current-carrying surfaces is just one of the ways in which G-E power connectors reduce joint resistance and minimize corrosion. Carefully regulated copper content of connector alloy provides current-carrying ability equal to that of conductor. Sharp, machine-serrated contact surfaces bite into the conductor, giving a permanent high conductivity joint that resists vibration and maintains positive pressure at all times. Interlocking sides confine the strands of the cable within the enclosure, reducing inter-strand resistance and taking full advantage of the cable's current-carrying capacity. Non-corrodible hardware of high-strength bronze alloy assures permanent tightness of connections.

There's a wide range of types—straight, tee, block, angle, parallel, expansion, ground, and many others. Why not place a trial order with your G-E sales representative? Write for Bulletin GEC-400—it contains 44 pages of valuable connector information. Section 856-57, General Electric Company, Schenectady 5, N. Y.

856-57

GENERAL ELECTRIC

Southern Yellow Pine Pole Data

Pole length, circumference at top, circumference at 6 ft. from butt, setting depth and weight with creosote for various classes of poles for distribution 15 kv and below. An arrangement from construction standards of Gulf States Utilities Co

TABLE I- Southern Yellow Pine Pole Dimensions

Class		1	2	3	4	5	6	7
Min. Top Circum., in. / Min. Top Diam., in.		27 / 8.6	25 / 8.0	23 / 7.3	21 / 6.7	19 / 6.1	17 / 5.4	15 / 4.8
Pole Length, Ft.	Dist. Grd. Line to Butt., Ft.	Minimum Circumference and Diameter at 6 Ft. From Butt						
16	3½				Circum., in. / Diam., in.	21.5 / 6.8	19.5 / 6.2	18.0 / 5.7
18	3½			26.5 / 8.4	24.5 / 7.8	22.5 / 7.2	21.0 / 6.7	19.0 / 6.1
20	4	31.5 / 10.0	29.5 / 9.4	27.5 / 8.7	25.5 / 8.1	23.5 / 7.5	22.0 / 7.0	20.0 / 6.4
22	4	33.0 / 10.5	31.0 / 9.9	29.0 / 9.2	26.5 / 8.4	24.5 / 7.8	23.0 / 7.3	21.0 / 6.7
25	5	34.5 / 11.0	32.5 / 10.4	30.0 / 9.6	28.0 / 8.9	26.0 / 8.3	24.0 / 7.6	22.0 / 7.0
30	5½	37.5 / 11.9	35.0 / 11.1	32.5 / 10.4	30.0 / 9.6	28.0 / 8.9	26.0 / 8.3	24.0 / 7.6
35	6	40.0 / 12.7	37.5 / 11.9	35.0 / 11.1	32.0 / 10.2	30.0 / 9.5	27.5 / 8.7	25.5 / 8.1
40	6	42.0 / 13.4	39.5 / 12.6	37.0 / 11.8	34.0 / 10.8	31.5 / 10.0	29.0 / 9.2	27.0 / 8.6
45	6½	44.0 / 14.0	41.5 / 13.2	38.5 / 12.3	36.0 / 11.5	33.0 / 10.5	30.5 / 9.7	28.5 / 9.1
50	7	46.0 / 14.6	43.0 / 13.7	40.0 / 12.7	37.5 / 11.9	34.5 / 11.0	32.0 / 10.2	29.5 / 9.4
55	7½	47.5 / 15.1	44.5 / 14.2	41.5 / 13.2	39.0 / 12.4	36.0 / 11.5	33.5 / 10.7	
60	8	49.5 / 15.8	46.0 / 14.6	43.0 / 13.7	40.0 / 12.7	37.0 / 11.8	34.5 / 11.0	
65	8½	51.0 / 16.25	47.5 / 15.1	44.5 / 14.2	41.5 / 13.2	38.5 / 12.3		
70	9	52.5 / 16.7	49.0 / 15.6	46.0 / 14.6	42.5 / 13.5	39.5 / 12.6		
75	9½	54.0 / 17.2	50.5 / 16.1	47.0 / 15.0	44.0 / 14.0			
80	10	55.0 / 17.5	51.5 / 16.4	48.5 / 15.4	45.0 / 14.3			
85	10½	56.5 / 18.0	53.0 / 16.9	49.5 / 15.8				
90	11	57.5 / 18.25	54.0 / 17.2	50.5 / 16.1				

TABLE II

Specified Depth For Setting Distribution Poles

Pole Length Over-All, Ft.	Straight Lines, Ft.	Curves, Corners and Points of Extra Strain, Ft.
30	5.5	6
35	6	6
40	6	6
45	6.5	7
50	7	7.5
55	7.5	8
60	8	8.5
65	8.5	9
70	9	9.5

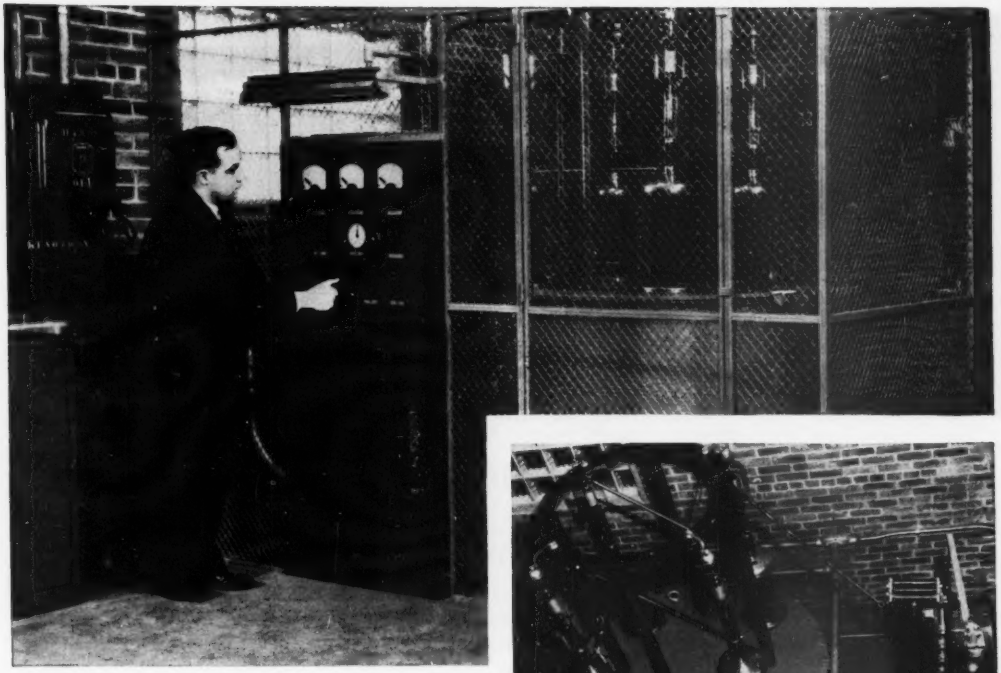
TABLE III

Pole Weights With 12-Lb. Creosote

	Weight, Lb.		
Length, Ft.	Class 7	Class 6	Class 5•
25	371	435	530
30	509	604	710
35	625	758	922
40	774	922	1124
45	954	1124	1336
50	1105	1329	1558
55		1569	1802
60		1728	2014
65			2374
	Class 4□	Class 3	Class 2
25	615		
30	827		
35	1071	1208	
40	1336	1548	
45	1590	1844	2109
50	1844	2141	2480
55	2131	2438	2862
60	2396	2841	3265
65	2788	3222	3710

•Weights of class 5 same as weights of 7 in. diam. top poles.
□Weights of class 4 same as weights of 8 in. diam. top poles.

Note—Poles set in soft ground or quicksand may be set in a barrel worked into the hole and filled with gravel or cement. Poles set in loose or swampy ground shall be supported by guys and where necessary by bog logs attached at the ground line



Rochester Gas & Electric's newest kenotron is this 125-kv test set installed at terminal station No. 29 on its new 34.5-kv underground cable system.

R. G. & E. purchases 125-kv cable test set as a result of earlier experience

For almost 25 years, Rochester Gas & Electric Corp. of Rochester, N. Y., has used a 50/100-kv G-E kenotron test set on its 11-kv underground cable system, and has recently purchased an additional kenotron for testing cable on its new 34.5-kv system.

General Electric d-c cable test sets improve continuity of service by detecting cable faults before they occur. Thus, emergency calls are avoided and repair crew operations can be scheduled when loads are off peak. Also, repair materials can be purchased far enough in advance to avoid being "caught short."

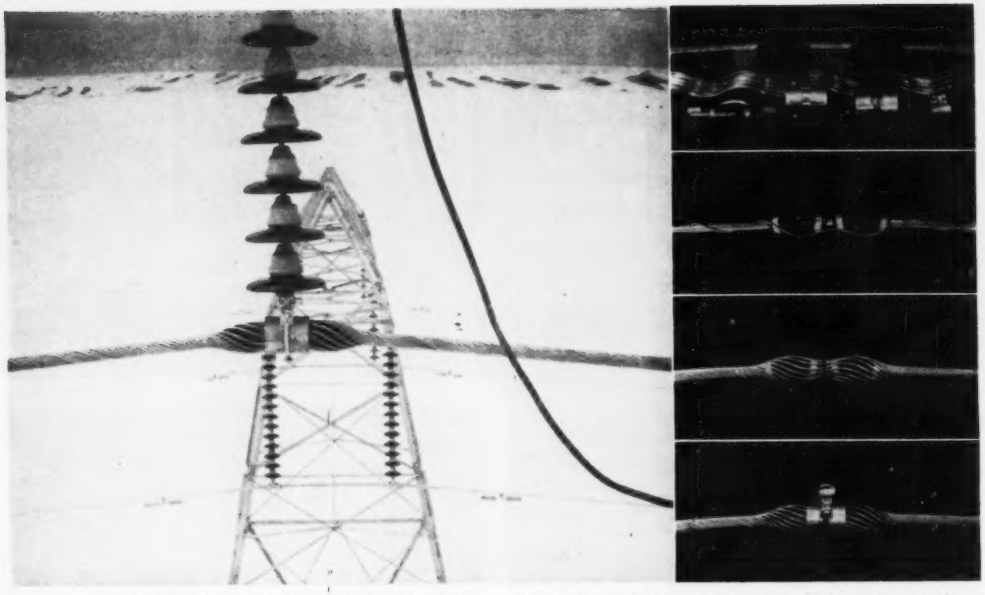
D-c cable testing causes no deterioration of cable insulation. For details on the many other advantages of d-c testing with G-E kenotron sets and for useful application data, call your nearest G.E. representative or write to Section 401-91, General Electric Company, Schenectady 5, N. Y.

Cable testing equipment can be included in specifications for a complete cable installation—at a cost that is almost insignificant in the total outlay.

It will pay you to include this equipment. You will have it when you need it—beginning with the acceptance tests, and continuing through periodic testing during the entire life of the system.

401-91

GENERAL ELECTRIC



INITIAL INSTALLATIONS on the Bonneville Power Administration 287-kv lines. Two compounded neoprene inserts placed under basketed section of preformed armoring keep rods off the conductor at centerwaist. Lightweight cast shoes are clamped into position, insulators held to U-bolt connecting shackles with pins or bolts. Insert makeup shown above

New Transmission Line Suspension Uses Preformed Armor Rods

THOMAS F. PETERSON
President
Preformed Line Products Co
Cleveland, Ohio

Preformed armor rods in combination with conventional shackle and insulator hardware have been adapted to a new type of transmission line suspension. Preformed armor rods are applied to the conductor, as shown, over two specially-compounded neoprene inserts sized to keep the armor rods off the conductor at the midpoint. Two lightweight cast shoes, that conform to the center waist section of the armor between the inserts, are clamped in position. A "U-bolt" shackle is slipped on horizontally and rotated 90 deg so that the eyes are vertical. Insulators are connected to the shackle with conventional pins or bolts.

Cradling the conductor in this manner largely eliminates the concentrated weights, pressure, and bending responsible for most vibration fatigue failures. There is no apparent abrupt change in continuity as to stiffness or mass. Use of preformed armor rods and neoprene inserts, plus the stiffening due to the large over-all diameter at the support point increases the damping capacity of the assembly.

The armor rods themselves are not subjected to undue stressing, particularly at the mid-section, where they straighten out slightly during severe bending and so preclude the development of excessive bending stresses. At the same point the armor rods bridge the distance between the neoprene inserts so there is no contact between rods and conductor.

Designing this suspension to provide a variable longitudinal holding strength of 3,000 to 6,000 lbs makes it possible to limit unbalanced forces resulting from broken conductors. Eliminating these unbalanced forces by permitting conductors to slip within the clamps will relieve transmission towers and should permit an improved tower design based on predetermined "slip strengths."

Excellent electrical contact and uniform current distribution between armor rods and conductor is developed as each rod circles the cable and crosses from one strand element to the next over a distance of 50 to 115 inches depending on the cable size. As a result any arc-over or transfer of current from armor to conductor is easily handled, eliminating the danger of conductor or armor pitting where clamp shoes and shackles are applied.

The contact resistance between one armor rod and the conductor is very low and is maintained at a low figure despite aging in service. The large radiating area of armor and clamps insures maximum current carrying capacity. There are practically no magnetic losses and so, as a result of the improved conductivity in the vicinity of the support, the equivalent resistance per unit length of assembly will be low and losses correspondingly low.

Armor rods on Drake 795,000 circular mill ACSR showed no visible corona at voltages of 272 kv to ground (455-kv phase-to-phase). Body of the clamp and armor rods developed no corona (except at the cotter pin) at

(*Continued on page* 116)

Planning New Tie Lines?

Include these features of

Speedomax Telemeters

In planning new capacity or new transmission lines, plan at the same time to take advantage of the features of Speedomax Telemetering Recorders to solve some of your increased dispatching problems. Here are some of the characteristics of Speedomax Telemeters which make them the choice of many of the country's major utilities:

Response: A choice of impulse or continuous types, depending on application requirements.

Accuracy: Measurements are reproduced so accurately that transmitter and receiver charts can't be told apart. Transmitting and receiving instruments use the potentiometer method.

Self Synchronizing: Speedomax receiver automatically keeps in step with its transmitter, even when instrument power sources are at different frequencies. No synchronizing adjustments.

Transmission Distance: Speedomax equipment operates through any telephone, carrier or microwave channel, and works over any distance within the capability of the channel.

Simplified Testing: Channel can be checked and calibrated without meter tests, using integral checking facilities.

Retransmitting and Totalizing: Instruments can be equipped for automatic totalizing of area generation, net interchange, etc.

Automatic Control: Speedomax Telemeters can be equipped with various control devices and incorporated directly into L&N Load-Frequency Control.

For details, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl Ad ND46-58-463(3)

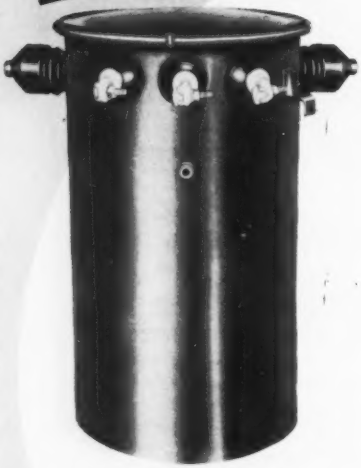
Wagner
TRANSFORMERS
. . . the choice of leaders in industry

Standardized . . .

Wagner

and here's what it means to you:

When you make your selection from Wagner's widely diversified line of distribution transformers—you get the benefit of improved design . . . better performance . . . longer life . . . *plus* standardized mechanical features that mean easier installation and greater convenience in handling and maintenance. These distribution transformers are standardized in full accordance with E. E. I.-NEMA recommendations and are available in all standard kva ratings and voltage ratings.



Type HEB—Sidewall mounted high voltage bushings. 10 kva unit shown.

SINGLE-PHASE

Type HEK—Cover mounted high voltage bushings. 15 kva unit shown.

Type HEX—Pocket mounted high voltage bushings. 50 kva unit shown.

- in every rating and design

DISTRIBUTION TRANSFORMERS

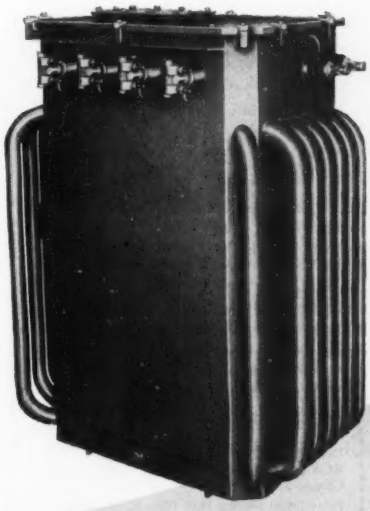
All Wagner pole-type, single phase transformers with round tanks in ratings 50 kva and below are now furnished with the Wagner Form W element, with preformed cores of cold rolled, oriented grain steel and with the exclusive SHUR-SEAL Cover that provides true sealed tank construction. The SHUR-SEAL Cover prevents "breathing" and insures against leakage of oil during shipment or handling.

* * *

Wagner has a nation-wide organization to provide fast, convenient service, with branches in 31 principal cities. Bulletins TU-180 and TU-181 give complete information on Wagner Transformers.

Vertical type with sidewall mounted high voltage bushings.

THREE-PHASE



Type HPB—Sidewall mounted high voltage bushings. 112.5 kva unit shown. High voltage bushings are cover mounted on types HPK and HPL.

® Wagner Electric Corporation 1891 1951

WAGNER ELECTRIC CORPORATION

6456 PLYMOUTH AVE. • ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS • AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

T51-14

From dispatch center in Wichita, orders flow out over RCA radio network to all KGE trucks and cars . . . anywhere in area, day and night.

Field superintendent gets trouble call by radio. Directs field crews to outage while he drives there himself.

Radio-directed crews reach trouble in record time. KGE can cover area with fewer trucks, fewer men . . . thanks to RCA 2-way radio.

How a Kansas Utility

Speeds Up Field Operations

with RCA 2-WAY RADIO

Radio directs 107 trucks and cars all over southeastern Kansas for Kansas Gas and Electric Company. Could your business profit from radio, too? Read answer below . . .

Radio Covers 20,000-Square-Mile Area

Kansas Gas and Electric's system spreads out all the way from Kingman 200 miles east to the state line . . . a big territory crisscrossed with vital power lines . . . a job made to order for RCA 2-way radio coverage.

Gives Faster, Better Service

Eight base radio stations blanket the area with main dispatch headquarters at Wichita. Over this network, calls can reach any truck or auto anywhere in the territory. Result: faster service all along the line, less outage time because radio sends the nearest crew to the trouble. Less lost mileage, less wear and tear. More efficient use of men and equipment. And more reliable communications—especially when telephone lines are knocked down by storms. *It's all typical of what RCA 2-way radio can do in any widely spread-out field operation.*

Could Your Business Use 2-Way Radio?

If you operate far-scattered field crews, RCA 2-way radio can save you time and money in dozens of ways. Puts a "phone" in every truck or car. Operates in all weather. Uses standard tubes. Low operational cost. Easy to install and maintain. Mobile units are compact, lightweight, rugged.

Let RCA Help You . . . Now

RCA helps put radio to work for you. Makes initial study. Helps with FCC permit, installation. And nation-wide RCA Service Company handles installation and service if desired. Find out *now* how 2-way radio can save time and money for *you*. Clip and mail coupon for your FREE 2-way radio booklet . . . *today*.

Dept. 45 UD
RCA Engineering Products
Camden, N. J.

Please send me my FREE copy of illustrated booklet, "RCA 2-Way Radio for Industry"

Name_____

Title_____

Company_____

Address_____

RCA **RADIO CORPORATION of AMERICA**

Preformed Armor Rods

(*Continued from page* 112)

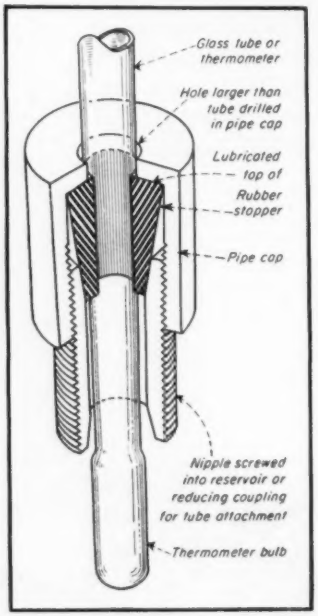
350 kv to ground. Although the ends of the armor rods showed no evidence of corona at approximately 180 kv to ground, the application of 3-in. diameter spheres mounted on conducting rubber washers made it possible to go to 262 kv to ground, that is 455-kv phase-to-phase without evidence of corona.

Inexpensive Packing Gland Assembled for Glass Tubing

JAMES E. DRUMMOND
Results Engineer, Tidd Plant
The Ohio Power Co.
Brilliant, Ohio

Packing glands for attachment of glass tubing to metal have been assembled from readily available parts. Two uses are: (1) thermometers for condenser tests with the bulb directly in the circulating water stream having about 10-psi pressure and (2) well-type manometers at 15-psi pressure without leakage.

A tapered rubber stopper, preferably with a hole through the center, was secured from the chemical laboratory supplies. If not already provided


Glass tube or thermometer
Hole larger than tube drilled in pipe cap
Lubricated top of Rubber stopper
Pipe cap
Nipple screwed into reservoir or reducing coupling for tube attachment
Thermometer bulb

PACKING GLAND ASSEMBLY of rubber stopper, drilled pipe cap, and nipple

Here's Why You Get Extra Service with VICTOR TRANSMISSION PINTYPES

VICTOR Transmission Pintypes give extra long life because they're designed for severe service and made to rigid specifications. Each is thoroughly inspected at every point of manufacture. Performance data *proves* they furnish years of trouble-free service! Choose VICTOR—the finest insulators skilled craftsmen and modern methods can produce!

V UNEQUALLED STRENGTH! VICTOR'S de-airing process produces porcelain of maximum density, strength and resistance to impact.

V CUSHION COATED JOINTS absorb thermal variations and mechanical shock.

V SMOOTH, HARD GLAZE protects against weathering and contamination, assists self-cleaning, reduces maintenance and replacement costs.

VICTOR NO. 245 TRANSMISSION PINTYPE INSULATOR. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

V LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tying quick and easy.

V QUALITY CONTROL! All shipments of flint, feldspar, and clay are stored in separate bins and tested for quality and purity before use.

V CONTROLLED TESTING and PROCESSING of cement assure highest bond strength at assembly joints.

V HIGHEST QUALITY WET PROCESS PORCELAIN gives unexcelled dielectric and mechanical characteristics.

Do You Know that...

VICTOR carries a complete line of transmission and distribution line hardware. These high quality products include aluminum, forged steel and malleable iron strain and suspension clamps as well as arcing horns, yoke sets and other allied fittings.

Specify

VICTOR

TRANSMISSION PINTYPES

VICTOR INSULATORS, INC. VICTOR, N. Y.

IT's
KLEINS

201-NE Plier

5233 Klein-Kord Safety Strap

5249 Klein-Line Tool Belt

1901-M Climber

1628-38H Klein Chicago Grip

When it comes to equipment on which life depends—safety straps and belts, climbers and grips, pliers and tools—there can be no compromise with quality.

Nearly a century of experience is back of Klein equipment for linemen and electricians. Today the name Klein is recognized for highest quality wherever such equipment is used. When life is at stake, only *the best* is *good enough.* In tools and equipment, this best is Kleins—"since 1857."

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

If you have not received your copy of the Klein Pocket Tool Guide, write for one. It will be sent to you without obligation.

Since 1857

Mathias KLEIN & Sons

Established 1857 — Chicago, Ill., U.S.A.

3200 BELMONT AVENUE CHICAGO 18 ILLINOIS

with a hole that would make a snug fit on the desired size of glass tubing, a suitable hole was bored. A pipe nipple with approximately the same outside diameter as the large end of the rubber stopper, and also a pipe cap to fit the nipple, were obtained. Through the center of the cap was drilled a hole slightly larger than the glass tubing.

Final assembly of the inexpensive unit is illustrated. The cap can be screwed down to force the stopper into the nipple and compress it on the glass tubing. Lubrication on the upper end of the stopper makes tightening of the gland easy. The free end of the nipple can be screwed into a reservoir, or a reducing coupling to which the tubing can be connected. If a thermometer is being used, it is forced through the stopper far enough to give proper immersion. After the gland has been assembled the thermometer well is removed from the circulating water piping and the nipple holding the thermometer is screwed into its proper position.

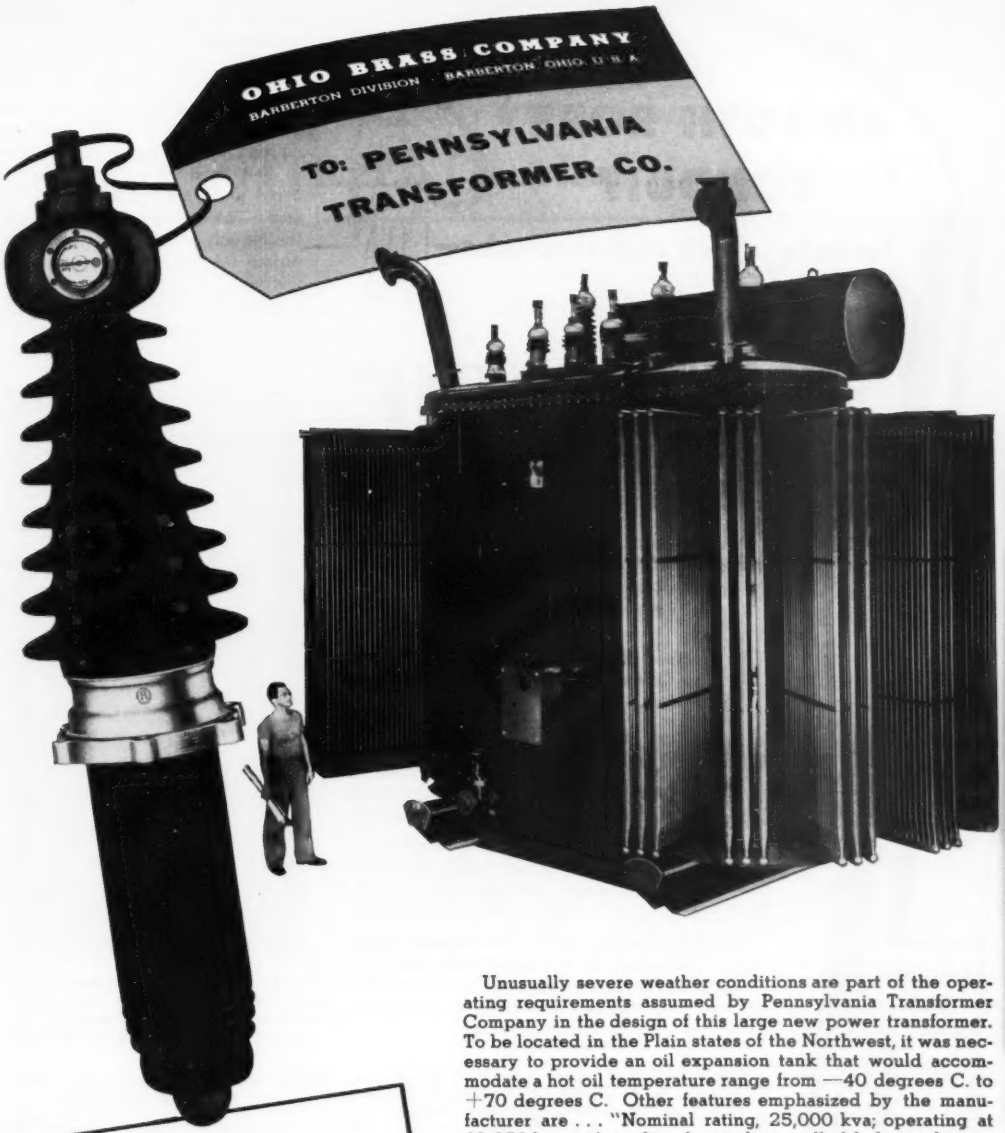
Carrier Detects Glaze And Speeds Melting

S. C. BARLETT
Electronics Section Head

G. H. McDANIEL
System Operation Section Head
American Gas & Electric Service Corp
New York, N. Y.

Detection of glaze or frost on transmission lines can be done by noting the attenuation of high-frequency carrier communication or relaying signals sent over these lines. Detection was secured originally through modification of carrier-current pilot-relay sets. Present-day pilot sets are equipped with a relay and an adjustable resistor. The relay introduces a resistance to make the receiver very sensitive to changes in input signal. Glaze readings are obtained by momentarily pressing a glaze push button.

First step in glaze melting is to sectionalize the line. It is grounded at the far end to produce a short circuit current greater than normal line current. From 550 to 750 amp is applied on the 132-kv AG&E system. No service interruption occurs on double-circuit lines, but system voltage may be slightly reduced. When one circuit is ice-free, it is restored to



Unusually severe weather conditions are part of the operating requirements assumed by Pennsylvania Transformer Company in the design of this large new power transformer. To be located in the Plain states of the Northwest, it was necessary to provide an oil expansion tank that would accommodate a hot oil temperature range from —40 degrees C. to +70 degrees C. Other features emphasized by the manufacturer are . . . "Nominal rating, 25,000 kva; operating at 31,250 kva with cooling fans to be installed below radiators. Base design permits rolling or skidding in any direction, and jacking without radiator interference. Cut-away box base members improve ventilation for underparts and offer easy access for painting. Among other elements contributing to highest reliability are . . ."

Ohio Brass

MANSFIELD • OHIO

4140-H

O-B BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER

SMOOTH BORE CONDUIT

for safe, quick pull-throughs—

with

BERMICO®

8-FT. LENGTHS

YOU WON'T HAVE TO WORRY about short-circuits caused by sheath abrasion when you do your fishing through Bermico Fibre Conduit. The unusually smooth bore of its 8-foot lengths provides a continuous raceway through which cable and wires can be speedily drawn—without injury to their coverings.

Another advantage is Bermico's **Complete Line of Bends,** which, with 5° angle couplings, enables you to meet unusual field conditions.

EASY TO WORK AND HANDLE

Bermico is **Easy to Work and Handle,** too. Its long lightweight lengths can be cut and tooled right in the field . . . make work easier . . . speed up installation.

You get **High Mechanical Strength** with Bermico. Tough and resilient, it offers best possible protection against accidental damage to wiring.

SMOOTH BORE

On your next job, plan to use Bermico Fibre Conduit. Its durability, safety and low maintenance cost will provide savings which will pay dividends over the years.

Distributed by

WESTINGHOUSE

Electric Supply Company

Offices in all leading cities

A PRODUCT OF BROWN *Company*

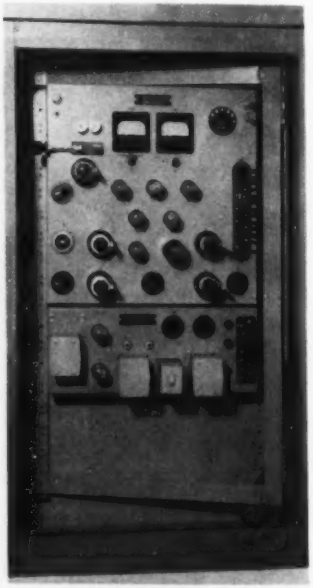
Berlin, NEW HAMPSHIRE

SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS
NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO
SEWER PIPE, CONDUIT & CORES • ONCO
INSOLEX • CHEMICALS

service and the other taken out and treated similarly.

Melting glaze on a Philo-Howard circuit required about 560 amp, 125,000 kvar and 32,000 kw. With temperatures around freezing and little or no wind, a 3/8 in. ice coating will melt in 30-45 min. This time may be reduced to 15 min by use of 650-700 amp. This method is economically feasible only on extensive systems with various interconnected generating sources.

When such a method is used, field observations need not be so heavily relied upon where lines are inaccessible. But often, careful observations must be made regarding weather favoring glaze formation. Heavy frost and glaze both give similar indications on the detector.



GLAZE DETECTION with carrier-current relay set is accomplished when regular carrier relay readings are made, but by pressing a sleet button momentarily

Sleet readings are normally taken once each shift. When glaze conditions are prevalent, readings are taken as often as necessary to determine line conditions. A very small change in signal should be sufficient to encourage use of glaze melting, since it involved a simple routine. If any great thickness of ice accumulates, excessive current and time will be needed to melt it.

Important points to know about COTTRELL *Electrical Precipitators*

A COTTRELL Electrical Precipitator is a major plant investment. Once installed it is operated over a period of many years, *thus multiplying year after year the benefits of top notch design and installation.*

And because of the many factors affecting the operating and collecting efficiency of a COTTRELL Precipitator, probably in no other field do the experience and "know-how" of the organization designing and installing the unit play a more important role in influencing the overall performance of the installation. That is why it is so important to remember this fact . . .

Western Precipitation Corporation is the organization that installed the first successful COTTRELL Precipitator over 39 years ago, still operating efficiently . . . and has consistently developed new refinements, new techniques, new applications that today have made it world famous in the science of recovering dusts, fly ash, mists, fogs and other suspensions from gases.

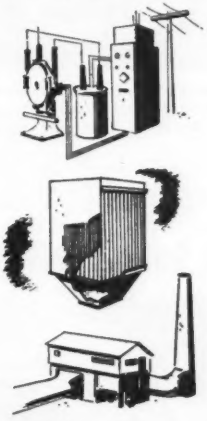
This is the first of a series of advertisements briefly outlining the important elements that go to make up a COTTRELL installation. Only long experience coupled with highest engineering ability, can assure the proper combination of these elements into a COTTRELL installation best suited to *your particular requirements*!

Basically, a Cottrell Precipitator consists of three major divisions each in turn consisting of many separate elements . . .

1. THE ENERGIZING SYSTEM, as its name implies, is the portion of the unit wherein the power is brought in, the voltage stepped up, then rectified to provide the unidirectional high voltage current supply for the Electrode System.

2. THE ELECTRODE SYSTEM consists of the high-tension ionizing electrodes and collecting electrodes through which the suspension-laden gas is passed to be cleaned. These electrodes can be of various designs, shapes and patterns and are equipped with various "rapper" arrangements which assist in keeping the electrodes clean of recovered materials.

3. THE HOUSING OR SHELL includes the structure containing the Electrode and Energizing Systems as well as the gas ducts and distributing system, the hoppers for receiving the collected material and other miscellaneous equipment.



Each of these three major divisions, together with their many individual parts, must be carefully engineered into ONE integrated and precisely-balanced unit to provide the successful and continuously-operating COTTRELL Precipitator. This series will take these major units apart to show in greater detail how the individual parts function and the varying types of design and construction. Watch for them.

10 COTTRELL ADVANTAGES

that make Cottrells unsurpassed for all types of recovery problems, hot or cold, wet or dry

1. LOWEST DRAFT LOSS — only a few tenths of an inch w. g.
2. LOWEST POWER COST — only ½ to 1 kwh. per 100,000 cu. ft. of gas cleaned.
3. LOWEST MAINTENANCE COST — all metal, few moving parts, no fire hazard.
4. LOWEST LABOR COST — operation can be fully automatic, if desired.
5. LONGEST LIFE — early Cottrell installations still operating after 39 years of continuous service.
6. HIGHEST EFFICIENCY — recovery efficiency approaches 100%, if desired.
7. UNIVERSAL APPLICABILITY — recover any suspension, solid or liquid — in any gas — over wide temperature ranges.
8. ANY CAPACITY — handle a few c.f.m. — or millions — with equal ease.
9. MAXIMUM FLEXIBILITY — readily adaptable to varying installation requirements.
10. LOWEST OVERALL COST — cost less per year of service, less per ton recovered. Often pay for themselves in a few months — always within a few years.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. La SALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

Do You Have This Helpful COTTRELL Booklet? In 28 pages of interesting charts, illustrations and descriptive data, it answers many of the questions engineers ask about COTTRELL design and construction. Send for your free copy. Ask for Bulletin CB61!

Special Inspection Lights Increase Production

H. E. VOGEL
Industrial Lighting Engineer
The Cincinnati Gas & Electric Co
Cincinnati, Ohio

AUTO FOG LAMPS provide special inspection lighting for paper products. Quantity and quality of production is upped. Reduced glare from units permits continuous inspection by operator for long periods of time with greater comfort

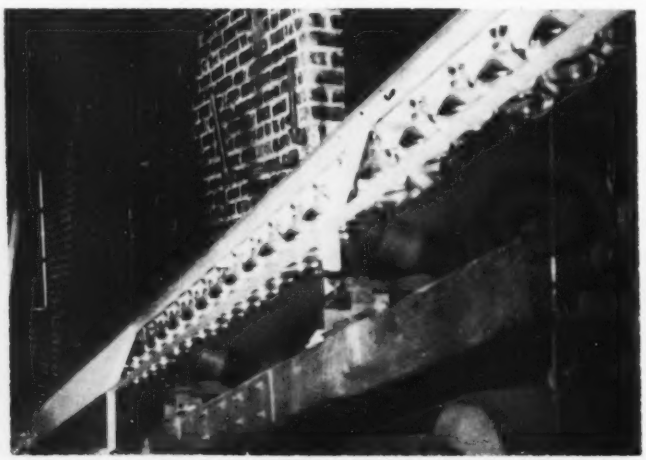
Special inspection lighting in the finishing room of the Harding Jones Paper Co, Excelli, Ohio, has improved the quantity and quality of production of their paper products. Special lighting units housing five 5½ in. diameter automobile fog lamps are used. These low voltage lamps have a narrow vertical light distribution (approx 5 deg) with high beam candlepower. When mounted on finishing table opposite operator's position with proper directional focus across horizontal plane of the paper sheets, imperfections in paper, such as pinch wrinkles, water spots, foreign materials, etc, are easily perceptible.

Glare from the face of these light sources is greatly reduced to a level where continuous inspection by the operator can be comfortably made over long periods of time.

Special localized lighting for difficult inspection and other seeing tasks is becoming a "must" for today's expanded production program.

Infrared Solves Moisture Problem

M. G. SLAWIN
Industrial Representative
Commonwealth Edison Co
Chicago, Ill.



CONVEYOR BELT carries small particle stone under 2 rows of sixty 250w infrared lamps to increase adhesion to asphalt coated roofing paper

Moisture removal by infrared heat from small stone particles used in making asphalt coated roofing paper at the Becker Roofing Co, Chicago, Ill., greatly increases adhesion of stone to the paper and saves material and labor. Infrared tunnel has two rows of sixty 250-w infrared lamps covering and enclosing a 16 in. wide by 40 ft long conveyor belt which carries stone continually under them at approximate temperature of 120F and speed of 150 ft per min. Lamps are divided into four separately controlled circuits to allow temperature variations. Tunnel design was aided by a Commonwealth Edison engineer.

Electric Heaters Cut Production Costs—Save Materials

R. J. LAVELLE
Duquesne Light Company
Pittsburgh, Pa.

Electric immersion heaters have increased production and efficiency and saved critical materials at the Pittsburgh Nipple Works, Inc, Pittsburgh, Pa., manufacturers of chrome plated plumbing fixtures and fittings. Working conditions have been improved, a fire hazard has been eliminated, and a better product is produced. Change-over from fuel-fired heaters required only a small investment since installation merely required "over the side" hanging of electric units in the solution and connecting them to the electric service.

The efficient use of coating materials and high quality electroplating is largely dependent on maintenance of proper temperatures in electroplating solution and other baths used in the process. This company recently discontinued the use of fuel for heating these baths and installed 24 kw of electric immersion heaters. A residential type fuel-fired water heater had been used to furnish hot water to water jackets on the nickel, copper, and chromium plating tanks. Fuel-fired heaters on these tanks boosted water temperature to obtain desired temperatures in baths. Cleaning and water rinse baths were heated directly by fuel-fired burners. Wide variations in temperature which were experienced with these methods of heating have been eliminated by change-over to electric heating. Two 5 kw electric immersion units were installed in the nickel tank; one 5 kw unit in the chrome plating tank and one 5 kw unit in the hot water rinse bath. In addition, copper plating tank and alkali cleaning tank were each equipped with a 2 kw electric immersion unit. Temperatures of baths are now regulated accurately, resulting in great economies in use of nickel, copper, and chromium.

Removal of the water heater and the large amount of piping required in connection with former methods of heating made space available for the installation of a 1000 gal nickel plating tank which replaced former 500 gal tank.

ACCURATE CONTROL of temperature is maintained in this nickel plating bath by two 5 kw immersion heaters, resulting in increased production and materials saving

INDUSTRIAL BRIEFS

New Conveyor Drive using overhung driving pulley, saved $8,000 installation cost alone in first installation on the Iron Range. New drive eliminates conventional head shaft and its bearings as well as low-speed coupling or chain drive. This eliminates maintenance on head shaft bearings and the low-speed coupling. Developed by the National Iron Co, Duluth, Minn., design uses special speed reducer equipped with extra large gear shaft and special antifriction bearings to provide extra capacity necessary for overhanging the driving pulley. Westinghouse Electric Corp.

Steam cleaning of grinding machinery with 30-kw electric steam generator at the Norton Co, Worcester, Mass., enables one man to clean in 2 hr a machine that formerly took two men 3½ hr using waste and standard cleaning agent. The steam cleaner is also very effective for cleaning toilet facilities. Dry steam is generated in tank by resistance of water to current passing between electrodes. Only 12 min is required to get 130 lb pressure. Livingstone Engineering Co, Worcester, Mass.

Laundry Mark identification with invisible ink is accomplished by the use of Type E-H4 (100 w) mercury vapor lamps installed both at the marking booths and sorting tables at the Star Laundry, Savannah, Ga. The invisible ink has improved customer relations and good will and has eliminated many claims resulting from the previously-used black ink markings. Deep purple lenses are used with the mercury vapor lamps. A special invisible ink of their own concoction is used which is not only cheaper than the commercial ink, but lasts only 2 or 3 washings which reduces the confusion on marking and reading. C. D. Anderson, Power Sales Engineer, Savannah Electric and Power Co, Savannah, Ga.

Bale Stacking by 1,000 lb capacity electric fork truck has cut bale-handling costs 50% at Green River Mills, Inc, Tuxedo, N. C. Storage space has been upped 10%. Baker-Raulang Co.

Reel winding of paper has been increased 25% by electronic drive on winding reel at Lee Paper Co, Vicksburg, Mich. Former output of eight paper rolls a day has been increased to ten. Reels are neater, more uniform, and more compact than with former manual method when operators had to make frequent adjustments of speed and tension by mere guess work. After 2 yr operation, 8 hr daily, electronic tubes in unit have never been replaced. General Electric Co.

SALES AND SERVICE

RESIDENTIAL • RURAL COMMERCIAL

"Light Conditioned" Home Draws Crowds

NELA PARK'S Gene Commery, father of "light conditioning" in the home, congratulates A. H. Spillman, Ohio Power Co, district sales supervisor, on a fine job in applying his ideas. Looking on are E. M. Cobb and C. E. Parks, Ohio Power

A "Beacon Home" at Newark, Ohio, sponsored by the Ohio Power Co is hailed as one of the nation's most outstanding examples of successful home "light conditioning" demonstration projects. More than 5,000 residents from the Newark area were attracted to this Beacon Home during its "run" from July 21 through the 29th.

Chief attraction was the application of G.E.'s newly developed home lighting recipes designed for the various seeing tasks throughout the average home. This all-electric home also featured complete home furnishings provided by the local merchants. Indicative of how public interest mounted is the fact that over 1,500 people attended the final week-end showing.

The project was conceived and directed by A. H. Spillman, district sales supervisor for the Ohio Power Co who successfully applied the ideas of Gene Commery, referred to as father of light conditioning in the home. Success of the undertaking is attributed to Spillman's thorough planning and the coordination of all elements involved in the project's operation. The Newark home is pointed to as a fine example of home lighting demonstration, thanks to cooperation on the part of utility, builder, contractor, and merchants, as well as good timing of effective promotion, publicity, and advertising.

Boosts Dishwasher Sales 275%

F. ENGLE TAYLOR
Manager, Planning and Training Division
Philadelphia Electric Co

Utility leadership pays off for manufacturer, distributor, dealer, and the utility itself. That was proven when the Philadelphia Electric Co won the 1950 Hughes Electric Dishwasher Award competition.

Sales of automatic electric dishwashers had never caught on in the Philadelphia market, largely because of the problem of installation. Customers in the area had been in the habit of purchasing other electrical appliances for a price that included installation "under standard conditions." Dishwashers had always been sold on a "delivered only" basis. This was an unsatisfactory arrangement since customers had difficulty securing competitive bids on installation.

The company recognized this problem and decided that it was necessary to establish a standard dishwasher installation charge in order to sell dishwashers successfully in the area. Working with the local distributors and plumbers a standard installation cost for automatic dishwashers was established and the following requirements were set up:

1. All automatic electric dishwashers sold by the Philadelphia Electric Co were priced to include installation under standard conditions.

2. Arrangements were made for a utility representative of the sales survey section to check installation specifications in each home where a dishwasher was sold.

3. Specifications were furnished to local plumbers who had agreed to accept this work on a standard installation cost basis. Installations that required extra work beyond normal requirements were to be handled on an extra charge basis.

This policy of a flat charge for a standard dishwasher installation has

The wall that can't be climbed!

A wall of brilliant light is a barrier no intruder can scale, no prowler can penetrate without exposure. Today, more than ever, this screen of protective lighting is a vital security measure, especially for plants engaged in defense work.

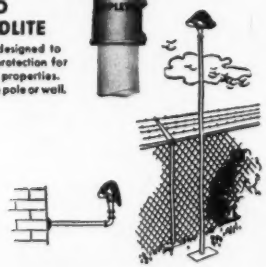
Appleton Floodlights are scientifically designed to guard industrial properties, while providing the good light necessary for best working conditions. The Elipso Standlite, for instance, rings your plant facilities with a broad band of illumination when properly spaced along a fence line or mounted on buildings.

For fixtures that meet every industrial requirement—including hazardous locations—whether indoors or out, contact Appleton, pace-setting manufacturer of electrical equipment for nearly half a century.

ELIPSO STANDLITE
Expertly designed to provide protection for industrial properties. Mounts on pole or wall.

DIFFUSO FLOODLIGHT
For even illumination of service stations, athletic fields, parking lots, etc. Pole, bracket or crossarm mounting.

SPORTO
For high intensity illumination over large areas. Weatherproof hood allows for complete vertical or lateral positioning. Pole, bracket or crossarm mounting.



APPLETON Floodlights

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Mission St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street CINCINNATI, 626 Broadway • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9

Resident Representatives: Binghamton, Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle, Portland, Ore.

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

MALLEABLE IRON CONDUIT FITTINGS

APPLETON

OUTLET BOXES AND SWITCH BOXES

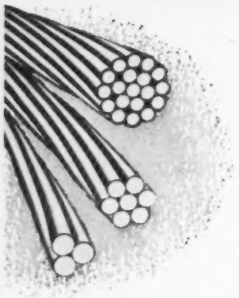
ELECTRIC

INDUSTRIAL LIGHTING EQUIPMENT

PRODUCTS

EXPLOSION-PROOF FITTINGS • RECEPTACLES

PAGE



Stainless Steel
STRAND
AND
Stainless-Copper
CONDUCTORS

Here's WHY they Save

Compared with other types strand of equal breaking strength, they . . .

- have 30-40% greater overload capacity within elastic limit.
- resist corrosion all the way through—not merely through a thin case of soft metal.
- offer highest tensile and vibration-fatigue strength (tensile strength 235,000 psi; corrosion-fatigue limit 50% of ultimate).

Here's HOW they Save

- They permit longer spans—therefore require fewer poles per mile.
- Being lighter, they are easier and faster to install in the field.
- More resistant to destructive factors, they last many times as long before replacement.

Let us tell you the whole story—

specific data, prices, recommended sizes.

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

done more to stimulate sales than any other single factor.

But there were other factors important in developing the Philadelphia dishwasher market:

Cooperation with dealers, sponsored by the Electrical Association of Philadelphia, featured successful prospect parties in dealer stores for the promotion of electric kitchen equipment, including dishwashers.

These dealer prospect parties served two purposes. They provided selling help for the dealer displaying dishwashers by demonstrating its advantages to the dealer prospects. They created new and growing dealer interest in dishwashers by increasing sales.

Cooperation with builders and architects was accomplished by a promotional advertising plan directed to the new home market. The utility took sizable space in the builders' section of two Philadelphia metropolitan newspapers and listed builders' names, locations of building operations, and stated that these were homes where you could buy the essentials of electrical living.

The amount of electrical equipment installed in new homes is indicated by stars—a 3-Star home has a complete electric kitchen including an automatic electric dishwasher, electric laundry, and automatic electric water heater. A 2-Star home has only two of these features; and a 1-Star home has only one of them.

This advertising program performed a real service to the public and created healthy competition among builders to get their names on the list.

Public demonstrations and dishwasher displays carried out the company's belief that visual education is a potent force in promoting the "electric living" idea. Complete kitchens, including electric dishwashers, were installed in district offices for display and demonstration purposes.

Once a week, on a rotation basis, these district office model kitchens are used for evening demonstrations to a selected group of prospects. Complete meals and interesting recipes are prepared by the home economists. The dishwasher is demonstrated during the program.

The merchandising activity on dishwashers by the utility resulted in a 275% increase in sales in 1950 as compared with 1949. In addition, dealer interest in dishwashers was stimulated and manufacturers and distributors enjoyed a healthy increase in dishwasher sales.

Window Contrasts Old and New

"RANGE OF THE STARS" promotion in service area of Pennsylvania Power & Light Co enlisted 794 dealers in a window display competition. Here is the top prize winner, Martin Electric, Harrisburg. At the right is the dingy kitchen of grandma's day, contrasting with the brightness and convenience of today's

CHANCE

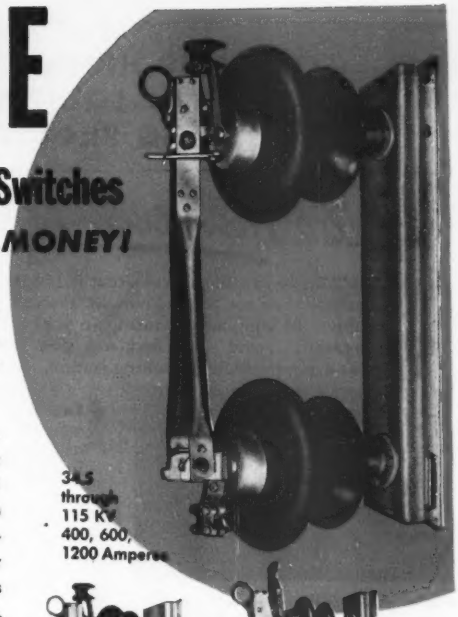
Hook Stick Disconnect Switches

... MORE FOR YOUR MONEY!

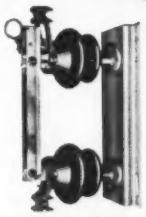
Chance Type BT Hook Stick Operated Disconnect Switches are made in a complete range of capacities for all types of single pole disconnect switch installations. They are available in single, tandem, or double throw types for horizontal mountings—upright, underhung, or vertical mountings up to 115 KV.

Dependable operation is inherent in their sturdy construction . . . RIGID CONTACT BLADES withstand heavy side thrusts, even if the closing force must be applied from an angle. Switches from 34.5 through 115 KV have a double tubular trussed blade which gives unequalled strength plus blade guides at the tongue which aid in contact alignment. 400 and 600 ampere switches rated 23 KV and below have reinforcing flanges on blades which increase rigidity and act as blade guides for closing the switch from an "out of line" position. 1200 ampere switches rated 23 KV and below have flat rigid parallel bus bar blades.

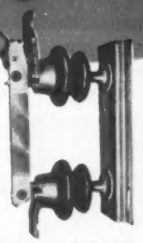
All Chance BT Switches have flanged bases that will not cut into wood supporting structures. Each size has been tested in accordance with A. I. E. E.-NEMA standards. Heat runs, high current tests, icing tests, insulation characteristics and life tests have proven the reliability of Chance Type BT Switches under all normal conditions.



34.5 through 115 KV 400, 600, 1200 Amperes



7.5 through 23 KV 400, 600 Amperes

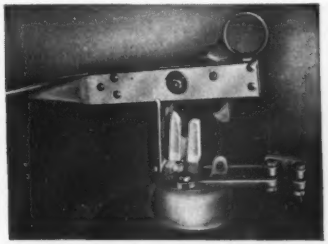


7.5 through 23 KV 1200 Amperes

Powerful Pryout for **EASY OPERATION**

A powerful lever action has been built into the pull ring mechanism and enables the operator to break ice or overcome clip adhesions with ease. All 400 and 600 ampere switches are equipped with time-saving built-in universal terminals. 1200 ampere switches have NEMA standard 4 hole terminal pads. Terminal lugs will be furnished on request.

Pressure Centered **LONG LIFE** Contacts



Pressure at the clip end is created by a conical compression spring combined with spherical washers. Split Tongue Contact casting "centers" spring pressure directly over contact area. All contacts are heavily silver plated on 1200 ampere switches. Lower ampere switches can be furnished with silver to silver or copper to copper contacts.

ABC INDUSTRIES

You know it's RIGHT when you specify CHANCE

A. B. CHANCE CO.

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

SOLVE YOUR HIGH-VOLTAGE ELECTRICAL-EQUIPMENT HOUSING PROBLEM

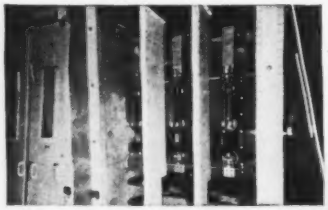
—with Trancell Materials

You'll find—as others have—that it is easy, fast, safe, and economical to use Johns-Manville Trancell for solving the problem of equipment housing in your station expansion program . . . and you'll find, too, that Trancell Materials make a smart, efficient-looking station.

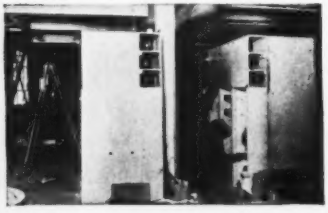
Faster to install — Trancell cuts easily, and can be quickly drilled right on the job with regular tools.

Easier to install—Trancell's light weight and strength make it easy to handle, easy to mount without framework.

Safer to install—Trancell is a non-metallic asbestos-base material . . . installed dry. It adequately isolates high-voltage equipment from fire and excessive heat.



Economical to install — Trancell's ease of fabrication and installation keep station expansion and future maintenance costs down.



Attractive when installed — Trancell makes up into neat, attractive, flush-type housings, panels, doors, and partitions that require no painting.

—for all high voltage power equipment enclosures — Johns-Manville Trancell Materials are made in many sizes and types. Recommended for transformer and switch gear housings and partitions, bus bar enclosures, and other electrical services. For further information write Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville

TRANCELL

an asbestos product for housing electrical equipment

Two "Carry On" Programs for Electrical Living

Looking ahead to the probable time when shortages of electrical goods will make utilities wonder how to keep sales personnel busy, the Westinghouse Electric Corporation offers two "carry-on" programs promoting electrical living. One is directed toward consumers and the other toward the building industry.

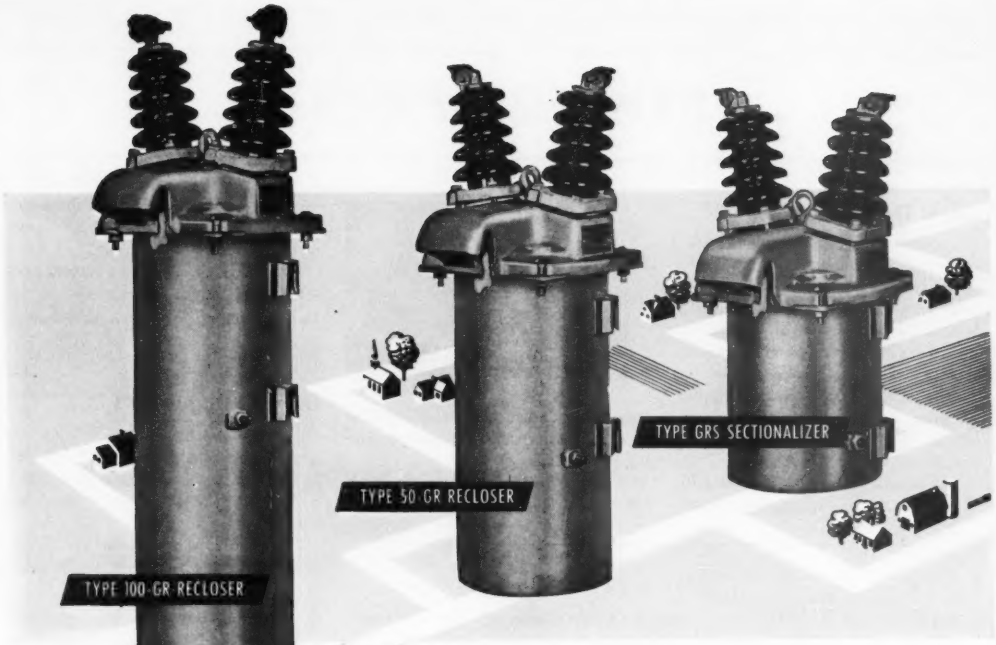
The consumer program points out that the realization of electrical living is a long-term operation, that the time to sell it is when people are thinking about building new homes and modernizing old ones. This may be a year or longer before decisions on plans are made. Another reason for keeping up promotion of electrical living is the normal and continual change of population—children growing up and new families moving in. These same conditions apply in respect to the building industry, whose concern is to build the homes people want.

In each of the two prospectuses offered by Westinghouse are listed and described available literature, films, and other promotional material. Included are suggestions for local programs, samples or descriptions of booklets, technical manuals, educational exhibits, kitchen planning material, and adequate wiring instruction and recommendations.

Blows the Dust Off

F. W. Wakefield Brass Co photo

DUST on the fluorescent tubes reduces the upward component of light from these indirect fixtures used in Vermilion (Ohio) schools. To prevent such accumulation, dust is periodically blown off the tubes with the equipment illustrated. It consists of an old vacuum cleaner fitted with a hose and hooked plastic pipe. Blowing the dust off the tubes takes about 10 minutes per room and helps maintain lighting efficiency



YOU NEED ALL 3

...for long-range distribution economy!

Calculate your probable fuse replacement costs over the next fifteen years—the period in which forecasts say loads will triple. We'll guess your answer suggests need for a less costly protective system. Ideally, it would be a system which eliminated fuse replacement costs... which stayed in perfect co-ordination *permanently*... which simplified the job of system sectionalizing on rural and suburban lines.

The units pictured above are components of a system which *does fulfill these requirements!* It's a completely mechanical system which employs Type 100-GR reclosers or reclosing breakers at the substation, and Type 50-GR reclosers co-ordinated with sectionalizers on the line. For forward thinking system planners it represents a *sure* way to gain this important objective:

THE HIGHEST DEGREE OF SERVICE CONTINUITY AT THE LOWEST LONG-TERM COST!

The mechanical protective system is just one of those analyzed in Booklet B-4700, which covers advantages, limitations and cost considerations of all types of protective schemes for rural and suburban lines. For your copy of this practical guide to better protection planning, write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60739

YOU CAN BE SURE... IF IT'S

Westinghouse

DISTRIBUTION APPARATUS

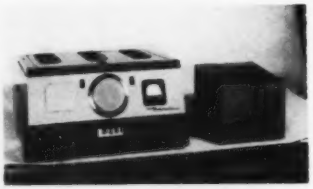
NEW EQUIPMENT

Snow Depth Reporter

Measuring the intensity of radiation from buried radio-active isotopes after it has passed through snow makes it possible to determine snow depth in terms of water equivalent.

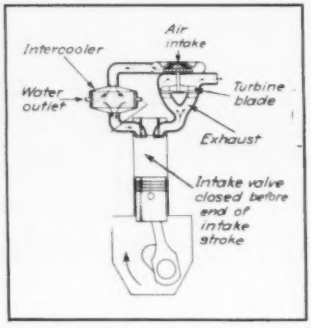
FM 2-way radio automatically transmits data to central recording station (shown above). Nickel-cadmium batteries, chosen because of their excellent low temperature characteristics, furnish power.

Individual sections of radio units, such as oscillators, frequency dividers,



transmitter and receiver stages are individually removable for easy servicing in the field.

Motorola, 4545 West Augusta Blvd, Chicago 51, Ill.



Diesel Engine

Cooling cylinder walls by intercooling diesel intake air as it leaves the super charger and closing the intake valve before the end of the intake stroke to cool cylinder air by expansion has provided the new Supairthermal diesel engine with the following advantages:

1. Increased power in less space
2. Increased thermal efficiency
3. Decreased lubricating oil consumption.

A complete range of sizes from 425 to 3200 BHP for stationary and marine applications is available.

An increase of 1/3 in the continuous hp rating is reported for a Supairthermal engine over a 150-hp supercharged engine of the same bore, stroke, and rpm.

Nordberg Manufacturing Co, Milwaukee 7, Wis.

Moisture Content Tester

Added protection for workmen against possible shock when using hot line tools is reported by the manufacturer of the SK Moisture Register when moisture content of hot sticks is checked.

Equipped with a narrow electrode designed specifically for hot sticks, moisture content from 25 to zero per cent can be determined. Readings can be made in three seconds.

Moisture Register Co, 1510 West Chestnut St, Alhambra, Calif.

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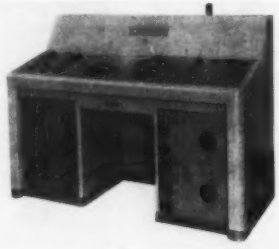
Magnetic Testing Desk

New dc magnetic testing desk contains all of the major components and



auxiliary equipment necessary for making routine dc magnetization and hysteresis tests and simple measurements.

The desk is designed to be used in conjunction with various permeameters and magnetic devices which make possible the testing of nearly all types of magnetic materials.

Normal range of control current extends from zero to 40 amperes.

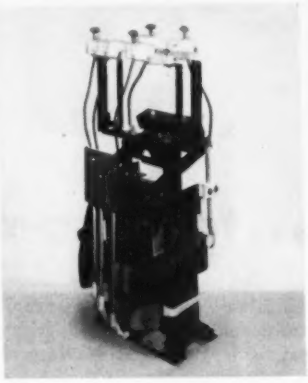
General Electric Co, Schenectady, N. Y.

•

Current Regulators

Lighter weight, higher efficiency, smaller size, and extra ruggedness are reported to be features of the new subway type "CMH" constant current regulator.

The oil-cooled regulators are automatically controlled units which can



operate, if necessary, submerged in water.

Ratings of 3 to 30 kw with primary voltages of 2400 or 4800 volts and secondary currents of 6.6 or 20 amps at 60 cycles are available.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

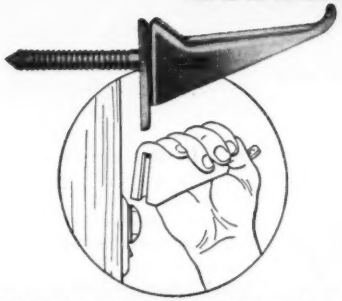
•

Time Delay Relay

A viscosity-stable silicone liquid produces a precise time delay in the Silic-O-Netic relay by controlling the rate at which a movable core is drawn into a magnetic field. Relay operates on the increased magnetic flux caused as the core reaches the pole piece at the top of the tube.

Manufacturer reports no appreci-

HUBBARD POLE STEPS...



No. 7235 Lag and Plate and No. 7236 Detachable Step are designed to prevent unlicensed climbing. The plate is slipped over the head of the lag and is prevented from turning by a lug in the lower part of the plate.
‡A.A.R. Std. *Western Union Std. †E.E.I. Std.

DESIGNED FOR SAFETY

Hubbard Pole Steps are designed to carry the heaviest human load and to withstand all normal conditions in use, with an ample safety reserve. They are forged from new Open Hearth Steel and bend tests are made periodically, after galvanizing, to check malleability and freedom from embrittlement. All Hook Head Steps have fetter drive threads and marking rings, which indicate proper installation depth and provide a tight seal against water seepage. See Hubbard Catalog No. 50, page 42, for the full line of Hubbard Steps for wood and metal poles, towers and concrete poles.

HUBBARD AND COMPANY
ESTABLISHED 1863
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
"Hang the Load on Hubbard Hardware!"

CEDAR
POLES
•
FIR
CROSS ARMS
•
Latest and most modern facilities for
PENTA CHLOROPHENOL TREATING
•
LONG LIFE
CLEANLINESS
LIGHT WEIGHT
•
TWO Strategically Located Yards:
Minneapolis, Minn.
Findlay, Ohio

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

able effect on time delay by ambient temperature or position changes.

Rated capacity is 10 amp at 120 volts ac with timings up to 4 minutes available.

Heinemann Electric Co, 324 Plum St, Trenton 2, N. J.

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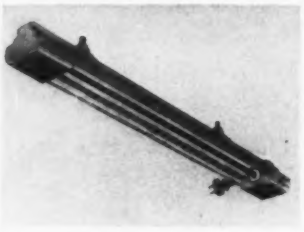


Infrared Food Heater

Uniform heat for keeping hot food hot is provided by this tubular element heater.

Ratings of 800 to 1100 watts are available.

Edwin L. Wiegand Co, 7513 Thomas Blvd, Pittsburgh 8, Pa.

•

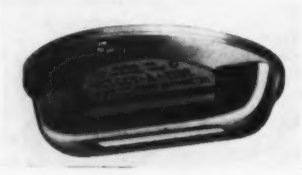
Safety Rope

Manufactured for the protection of linemen, maintenance and other workers who face electrical hazards. Se-Lectric manila rope is reported to possess high electrical resistance.

Electrical superiority of this rope is due to a special treatment which reportedly cuts down the rate of moisture absorption.

South Eastern Cordage, 641 NBC Building, Cleveland 14, Ohio

•



Fire Detector

Fitting against the ceiling the Detect-A-Fire initiates an alarm at the moment the surrounding air reaches a temperature pre-set at the factory.

It can be installed within new or existing alarm systems or can be made to actuate an extinguishing system directly.

Temperature settings up to 325°F may be had. The manufacturer reports an area as large as 625 square feet can be protected by a single unit.

Fenwal Inc, Ashland, Mass.

•

Package Impact Recorder

Concealed inside a package or mounted in a freight car or truck, the Impact-O-Graph provides information on when shipping damage occurred.

Aside from the psychological value it will have on truck drivers and handlers, this unit notes when a shock or impact occurs, the intensity of that impact, and from what direction the jolt came.

Recordings up to 28 days in length are made on a wax coated tape.

Impact-O-Graph Corp, Cleveland, Ohio

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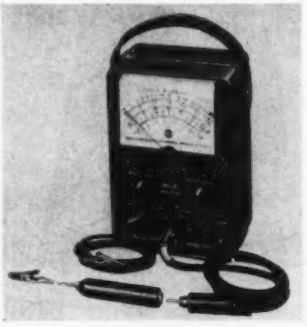


Vacuum Tube Volt-Ohmmeter

The ac-operated Junior Volt Ohmyst will measure dc voltages of 0.05 volts to 1200 volts in five ranges—0.1 volts to 1200 volts ohms in five ranges—resistance in five ranges from 0.2 ohm to one billion ohms.

Engineering features include high input resistance, electronic protection against meter burn-out, and metal shielding for stability in rf fields.

Radio Corporation of America, Harrison, N. J.

•

Derrick-Digger Attachment for Small Trucks

Shipped from the factory ready to be installed on service trucks by local mechanics, the Model 325 rig can be raised to working position in 30 seconds for lifting or pole setting jobs.

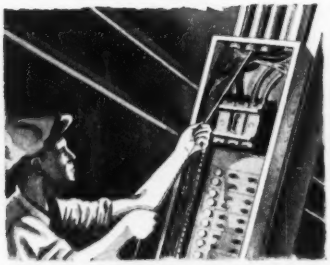
Interchangeable augers range in

"Can you imagine the boss asking a question like that?"

We were finishing up the wiring on a big aircraft plant the Government wanted fast. We sure did our part fast. The boss walks up to me, "Why," he asks, "are things going so smooth on this job?"

So I told him—

"First because we've got good men on the job. Then, too," I admitted, "this Triangle wire, cable and conduit we're using helps plenty. Take the hot-dipped galvanized conduit. It bends easily and we've had no trouble with the threads. Couplings go on easy, no burrs or broken threads. Two reasons — one, Triangle makes conduit and couplings right, two, Triangle protects the threads in shipment."



"Then take the circuit wiring. Before we get through we'll pull about a million and a half feet on this job. This Triangle Glazon is good in all ways. It's tough, pulls easy and every coil is perfect. When you pull that much wire, the difference between average and the best means a lot of money in time."

And then I told the boss about the help we got from Triangle and their distributor on this job. "Those two salesmen checked on this job constantly — they gave us all kinds of help in getting the material here when we needed it. Boss, I'll tell you — I'll take Triangle every time."

Ask your electrical distributor— he knows—

It MUST Be Right

THE TRADE-MARK OF TOP QUALITY!

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

IT *MUST* BE RIGHT

Glazon Building Wire • Glazon Non-Metallic Sheathed Cable • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit Hot-Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

5 Ways Better for Public Utilities

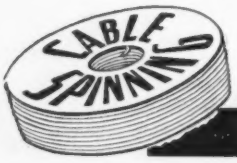
Cable Spinning in Field with Neale Model "K"

1. One-third LOWER INSTALLATION COST than with pre-assembled cables.
2. SAVES SPACE over open-wire construction in congested areas.
3. Provides EXTRA PROTECTION against storm damage.
4. Light weight single conductor cables can be handled in 300% GREATER LENGTHS than heavy pre-assembled cable. Reduces number of splices and installation labor costs.
5. REDUCES CABLE INVENTORY, as 1/c, 2/c or 3/c cables may be made up in the field as required. Invaluable in emergencies.

NEALE MODEL "K" SPINNER spins a single cable, or three 2" cables into a compact triangular pattern. Apex of triangle points down. Strand lies in groove formed by two top cables.

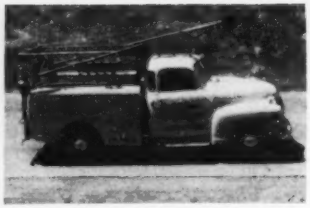
Drum rotated by two friction drive wheels which are rotated by wire being pulled from drum. Regardless of condition of strand, drum revolves once when 13" of wire is pulled. Drum carries two spools of spinning wire spaced to spiral 6½ inches apart for ample cable support.

Magnesium castings used wherever possible for lightness and strength. Weight approx. 36 lbs. Length 18½", 12" diameter, 4¾" exit.



NEALE Spinning Wires available in seven different types and sizes.

EQUIPMENT CO.
TOPEKA, KANSAS Phone 3-1829



size from 8 to 20 inches. Poles up to 35 ft in length may be handled.

Tel-E-Lect Products Inc, 10003 Minnetonka Blvd, Minneapolis 16, Minn.

•

Compressed Air Filter

Water, oil, sludge, and other foreign materials may be removed from compressed air by the Model B Condensi-filter.

Capacity is 30 cfm at 100 psi.

Hankison Corp, 263 Renton Building, 1501 Beaver Ave, Pittsburgh 33, Pa.

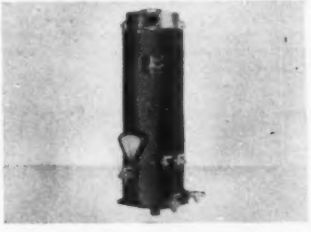
MORE NEW EQUIPMENT

Just Received

Appearing Next Issue

High Speed Camera
Electrical and mechanical aspects of a subject are recorded simultaneously on the same film providing a complete electro-mechanical picture.

Mechanical-Drive Steam Turbine
New line designed to cover a wide range of industrial applications, as well as for power-generation purposes.

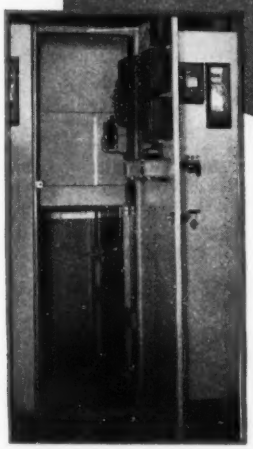


Lacquer Heater

Designed to make possible spraying of high solid content lacquer, etc. at elevated temperatures the Viscolator electrically heats the material to reduce its viscosity.

Heating elements and tubing are embedded in solid metal to permit in-

Better Because of Your Operating Experience



Welded-in floor plates provide a smooth rolling surface for your circuit breaker. Guide rails placed at each side of the breaker compartment add rigidity to the structure. A-3385

Ruptair is an Allis-Chalmers trademark.

YOU HELPED US design improvements into our switchgear. As the result of your suggestions and operating experiences, we added many new features including more panel space for instruments and relays, welded-in floor plates, wider guide rails, additional protection for wiring and made a more rigid switchgear structure. The new switchgear design is not only more functional, but it's attractive as well. It makes an impressive installation in any plant.

You requested more compartment space for mounting auxiliary equipment. So we designed a new and more spacious compartment for mounting power transformers, transfer bus and similar equipment. It permits you to make a variety of circuit arrangements in a single standard breaker unit.

You wanted to avoid special plant floors for the installation of switchgear. We designed welded-in floor plates to eliminate this requirement and still provide smooth rolling surfaces for the breakers. *Ruptair* magnetic air circuit breaker equipped with built in wheels roll over this steel floor smoothly and easily.

As the result of your experience and suggestions, special wiring is looped where flexing occurs to eliminate excessive wear. Wide full length guide rails on each side of the breaker compartment increase structural rigidity and protect wiring.

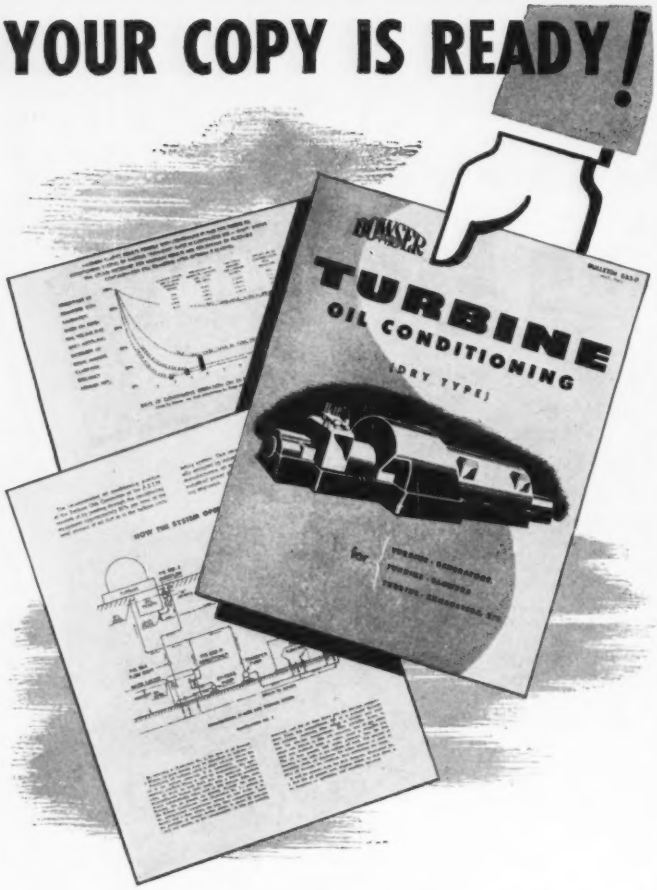
Your ideas have helped make standard Allis-Chalmers switchgear safer, stronger and better built. It's modernized to do a better protection job for you.

Standard Allis-Chalmers switchgear is composed of matched units, yet it can be tailor-made to suit your requirements. Get the facts today from your local Allis-Chalmers sales office. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

First in the U. S. with Metal-Clad Switchgear

YOUR COPY IS READY!



● A new 12-page booklet on Turbine Oil Maintenance has been prepared under the direction of Edwin M. May, a nationally recognized authority on lubrication engineering. A member of the Bowser sales engineering staff for many years, he has an M. E. Degree from Purdue, is Chairman of the New York Section of A.S.L.E., is a member of the Petroleum Applications Committee of A.S.M.E. and the Turbine Oils Committee of A.S.T.M.

● ● ●

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LIQUID CONTROL SPECIALISTS SINCE 1885

BOWSER

MAIL TODAY

BOWSER, INC., 1384 Creighton Ave., Fort Wayne 2, Ind.

Please send new Turbine Oil Conditioning Booklet

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

creased heat transfer.

Electrically heated units up to 40 gallons per hour are available.

Reliable Products Manufacturing Co, 123 DeKalb Ave, Brooklyn 1, N. Y.

●

Chain Hoist

Ratchet operating principle of the Coffing Hoist-Binder permits tightening or slackening off without releasing load for a new grab.

Handle of this hoist will bend before binder can be overloaded beyond safe limits.

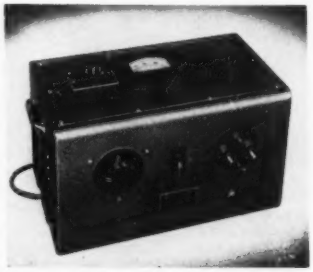
Coffing Hoist Co, 800 Walter St, Danville, Ill.

●

Current Supply

Plugged in, the Multi-Amp Model 1002 supplies current ranging from 0 to 500 amperes in stepless increments. Perfect wave form and accurate adjustment are reported for this model.

Used to test motor overload relays



the tester simulates motor overload or locked rotor conditions. All testing is performed with motor under test de-energized.

Devices which this unit may be used to calibrate are circuit breakers,

(*Continued on page* 140)

ElectroniK RECORDER now combined with ADVANCED TELEMETERING SYSTEM

General Electric frequency-type telemetering system with ***ElectroniK*** *strip-chart recorder.*

THE increasing need for rapid and continuous transmission of such measurements as total power generated or interchanged and other pertinent information has led to the development of telemetering equipment such as that shown above. An *ElectroniK* recorder assures rapid and accurate collection of all vital information at a central location . . . for easy evaluation and totalization.

The telemetering system comprises an arrangement capable of measuring, transmitting, receiving and recording any measurable variable that can be converted into an electrical quantity. It keeps the load dispatcher in constant touch with each station . . . helps him determine when to pick up or drop blocks of power, how well the outlying stations are maintaining their loads, and to keep up to date on the relation of his area to adjacent areas.

Measurements at distant points must be accurately transmitted and recorded in the shortest possible time. The *ElectroniK* recorder is combined with an *advanced telemetering system* to accomplish the job. For detailed information, write for a copy of Data Sheet No. 9.1-10.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

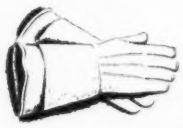
MINNEAPOLIS
Honeywell
Brown Instruments

CLEAN INSTALLATIONS. Individually mounted or grouped, wye or delta, whatever your standard wiring practice may be, you'll find it easy to design cleaner, safer installations with the new Westinghouse "CSP" Transformers.

Put Yourself ON THE SPOT

Where clearance means SAFETY

Put yourself in these shoes, high on a pole top where clearance means safety. That's where you'll appreciate the new Westinghouse "CSP"® Transformers with wall-mounted, high-voltage bushings that give you better working clearance—where they eliminate long loops that swing dangerously in the wind.



Try on these gloves, and you'll agree that it's important to have a large insulated knob to make hand-tightening easy, eliminating the need for tools.

Now back to the desk, where statistics talk best. Your own figures* can show you it's good business to standardize on "CSP" Transformers . . . to take advantage of this lower installed cost, better service continuity. Extra features like "Coastal Finish", bushings with unbreakable Enrup† knobs, and Wemco C-I (inhibited) Oil make it pay to specify Westinghouse "CSP" Transformers. J-70588

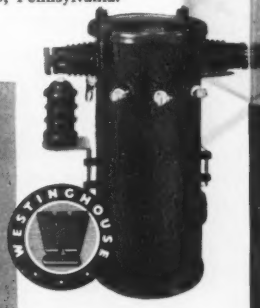
*If you have not yet made the detailed analysis of initial, installed and maintenance costs of "CSP" Transformers on the basis of *your own figures,* ask your Westinghouse representative for a copy of the check chart, B-4247B, "Transformer Costs and Their Relation to Profits". He'll be glad to give you details on the new product features, too. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

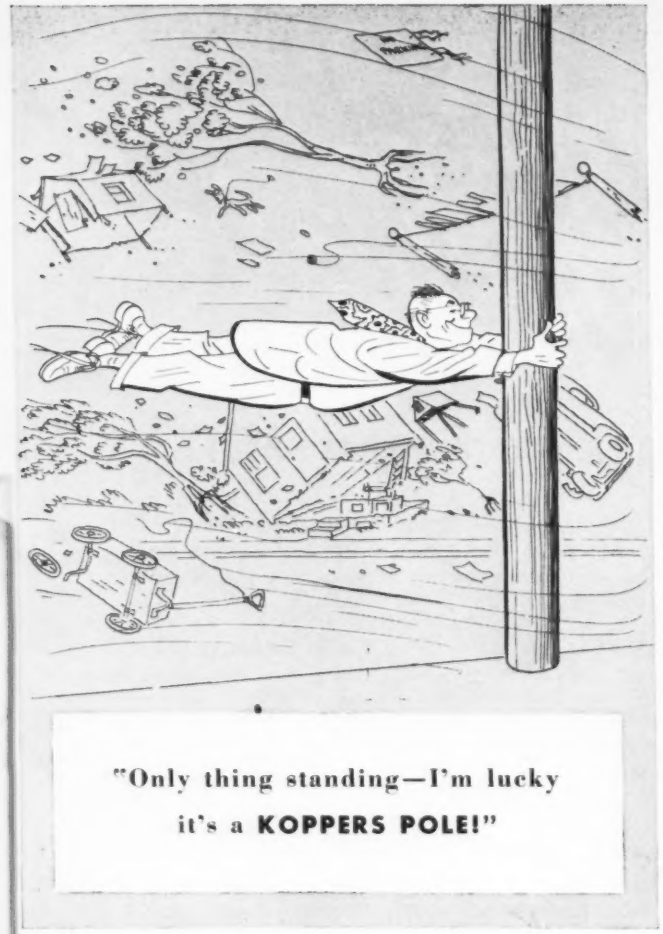
†T. M. Reg. U. S. R. Co.

YOU CAN BE SURE.. IF IT'S

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS





"Only thing standing—I'm lucky it's a **KOPPERS POLE!**"

● This man knew a good thing when he seized it. He's a lineman off-duty, no doubt.

Linemen know that Koppers Poles are strong. And they have good reason to know that Koppers Poles *retain* their strength . . . this means much less maintenance work for them . . . fewer poles to replace.

Choose Koppers! You'll get the kind of pole service that makes your line operation easier and more economical.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-TREATED WOOD

current transformers, relays, and overload relays for ac motors.

Multi-Amp Corp, 121 Cross Street, Harrison, N. J.

Traction Motor

Trolley coaches being placed in service in Cleveland and Boston are equipped with a new series-shunt traction motor. Acceleration is produced by unit when operated as a series motor—braking when operated as shunt generator.

Series motor is retained for propulsion because of its reportedly superior commutation, power economy, low maintenance. A separate shunt field is used with fixed resistor for dynamic braking.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

Electronic Flasher

Filamentless—this new portable electronic signal flasher emits a sharp flash of light from a cold cathode tube.

Three standard 90 volt batteries in series provide power. A flash-per-minute control is provided.

Haledy Electronics Co, 57 Williams Street, New York 5, N. Y.

Controller

Sensitive, instantaneous and accurate control of flow, temperature, pressure, liquid level and other process variables is provided by the Tel-O-Set controller.

Two models are available—one with fixed proportional band, the other with adjustable band.

Except for manual adjustments of

for all CONDUCTORS and CONNECTIONS

FARGO *A-G-E* SERIES HOT LINE CLAMPS!

Bi-Metal Tap
for Alum. to Cu.

for

All Aluminum Conductors . . . . . Cast Aluminum
All Copper Conductors . . . . . Cast Everdur
All Purpose . . . . . Cast Everdur
(Tin-Zinc Plated)
Aluminum-to-Copper Conductors . . Cast Aluminum
(With Bi-Metal Tap)

Fargo A-G-E Hot Line Clamps are available in three sizes — all with heavy-duty, Vanadium steel springs.

Ask your Line Material Field Engineer for further details

FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N.Y.

Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin

LM

COLLYER NEUTRAL SUPPORTED SERVICE CABLE ...is winning new friends everyday. From years of actual experience with this cable, major utility companies are finding it pays big dividends from every point of view.

It's easy to install. The bare messenger takes the load, leaving the phase wires tension-free for easy splicing and tapping. Stripping is easier, too, because there's no braided cover to remove.

It's easy to maintain. Neutral Supported Service Cable keeps tree damage and storm losses to a minimum. Jackets and insulations are engineered to withstand abrasion, sunlight, ice loads — to save maintenance money for years to come.

It's easy to look at. This cable gets rid of festooning once and for all. Its appearance is a credit to any neighborhood.

Collyer will be glad to work with you on your service cable problems. We offer a wide range of insulating and jacketing materials and many types of cable constructions. Let us quote on your requirements. Collyer Insulated Wire Co., 245 Roosevelt Ave., Pawtucket, Rhode Island.

CHOOSE *Collyer* **SERVICE CABLE**

reset on the band unit the controllers operate wholly in response to pneumatic signals.

Minneapolis-Honeywell Regulator Co, Minneapolis, Minn.

MORE NEW PRODUCTS
about which you should know

Moisture Register Co, Alhambra, Calif, have developed a **moisture testing instrument** specifically designed for testing wood flour, shavings, chips, sawdust, etc. . . W. H. Brady Co, Chippewa Falls, Wis, is marketing **self-adhesive, precut masks and gaskets** for spray painting, cleaning, sandblasting, etc.

Cherry-Channer Corp, 1488 Skokie Blvd, Highland Park, Ill, has developed two new standard **snap-action switches** whose design does not incorporate moulded parts. . . . Westinghouse Electric Corp, Pittsburgh, Pa, has tripled the ozone output of its **ozone deodorizer lamp.**

Daniel Woodhead Co, Chicago, Ill., has announced a new line of **service lights** featuring oil proof handles and removable fibre guard reflector. . . Rogers Corp, Manchester, Conn, is marketing a new fibrous material for **electrical insulation** applications requiring a minimum water absorption rate.

Soreng Manufacturing Corp, 9555 Eden Ave, Schiller Park, Ill., has developed a **3-circuit plug and receptacle** for fractional hp reversing circuits, appliance grounding, etc. . . Gedney Electric Co, New York City, N. Y., has added a No-Thread **90 deg. short conduit elbow** to its line.

Dynatronic Corp, Alexandria, Va., has announced a new **adsorption dry-conditioner** for industrial protection against moisture damage. . . . National Foam System, Inc., has introduced a new **liquid type mechanical foam for use on fires** involving polar solvents or petroleum products.

National Electric Products Corp, Pittsburgh 19, Pa. is manufacturing a **magnetic outlet finder** for steel duct under wood, concrete, or linoleum. . . . Murray Corporation of America, Scranton, Pa., has announced a new line of **electric ranges** featuring push buttons colored from deep red for "hot" to pale pink for "simmer."

ELIMINATE MOTOR FAILURE with class (H) insulation made with DOW CORNING SILICONES

Wet Motors

are a constant threat to your production schedules . . . unless they're wound with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H has at least 10 times the wet insulation resistance of the next best class of insulating materials. At Virginia-Carolina Chemical Corporation's Homewood mine, a 300 hp., silicone insulated motor was back in service 3 hours after flooding with mud and waste water. Under the same conditions, an identical Class B motor had to be reworked and rebaked. Similar experience over the past 5 years has persuaded many chemical companies to specify Class H exclusively for all condensate and centrifugal pump motors.

Hot Motors

die young . . . unless they're protected with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H insulation makes hot and hard working motors last 10 times longer than they ever did before. Silicone insulated spinner bucket motors in rayon mills last 6 to 24 times as long as Class A motors. Silicone insulation makes the high speed, rapidly reversing motors used by Cogsdill Twist Drill Company last 12 to 100 times as long as Class A or Class B motors. In a large steel mill, a crane hoist motor had 4 to 42 times the life of a Class B motor

Note to electrical Design Engineers

There's a rapidly growing industrial and military demand for Class H equipment . . . the only kind that can withstand the toughest operating conditions. Write for Catalog No. AY-9 listing Class H insulation components and specifications.

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

FIRST IN SILICONES

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK • WASHINGTON, D. C.

In CANADA: Fiberglas Canada, Ltd., Toronto • In GREAT BRITAIN: Midland Silicones, Ltd.

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

WHAT THEY'RE SAYING
at industry meetings

Electricity is the Key

Philip D. Reed, *chairman of the board, General Electric Co, before a dinner meeting of Union College faculty and secondary school science teachers, Schenectady.*

Only by increased production may we raise living standards for the tens of millions of people who find life a drab and desperate burden. A key factor in accomplishing this task of increased production is the electrical industry. But it is the ultimate job of management to see that this increase in productivity is carried out.

Depa Looks At 1952

James F. Fairman, *administrator, Defense Electric Power Administration, at the convention of the Maryland Utilities Assn, Virginia Beach, Va.*

It cannot be emphasized too strongly that the electric power outlook for 1952 is more serious than it was at any time in World War II. We are already touching bottom in various parts of the country. Several hydroelectric dams in the Northwest now under construction will not be available before 1953 or 1954. Prospects are that this region will not catch up with its power requirements before 1956 or 1957.

In the Southeast, a critical relationship between power supply and demand will prevail during the coming winter. Energy sent into the Southeast from neighboring regions will create a tight power supply situation in the eastern part of the country from the Great Lakes to the Gulf. The industrial North Central region is facing a power shortage in the fall of 1952 as a result of the inability to get structural steel on authorized controlled material orders for construction of electric generation stations.

About 1,400,000 kw is the estimated loss in capacity for 1952. The increase in power load from 1950 to 1953 is expected to be greater than the total energy developed in this country in the 57 years before World War II.

During 1952 about 9½ million kw is scheduled for installation. Yet with this capacity installed, it is expected that the national margin between power supply and demand in the winter of 1952-53 will be one of the smallest on record.

Electric power is one of the fastest growing ingredients in our economy. From 1946 to 1950, total kilowatt hours for residential and rural use in this country increased 74%. The expectation is that approximately 1,800,000 residential customers will be added this year. In the last five years, kilowatt hours used on the farms of this country have increased 160%. It is expected that as much as 13 billion kwhr will be needed for aluminum production in 1952 from the public supply.

Load growth which is forecast for 1950 through 1953 parallels to a remarkable degree the trend that prevailed from 1940 to 1943. Actual load growth during the first half of this year has slightly exceeded the forecast. But nothing we have learned to date indicates any reason for deviating from the program as now developed.

Common Strength of Free Man

Charles F. Brannan, *Secretary of Agriculture, at dedication of Flambeau River Station, Dairyland Power Cooperative, Ladysmith, Wisc.*

Many power companies have been reluctant to sell electricity to cooperatives, or have tried to sell to REA co-ops at disadvantageous rates. The fact is, commercial utilities have little spare electricity to sell. The nations' electric industry has a slim margin of reserve capacity. The margin is so slim, if no new capacity were added, there is no assurance the growing demand for electricity could be met this winter. The country is losing the race against increased power requirements, with the margin for growth now a matter of months. Those that oppose development of our power capacity argue they can't afford to build new generating stations. Yet during 1950, they paid stockholders the highest dividends in history.

Commercial utilities have been ready to celebrate the near-completion of rural electrification long before most farms have electricity. The REA job will not finish when every farm is electrified and it will not be easier for co-ops to meet future increased needs for power, as power companies who see in you a threat to their future business will continue to obstruct you.

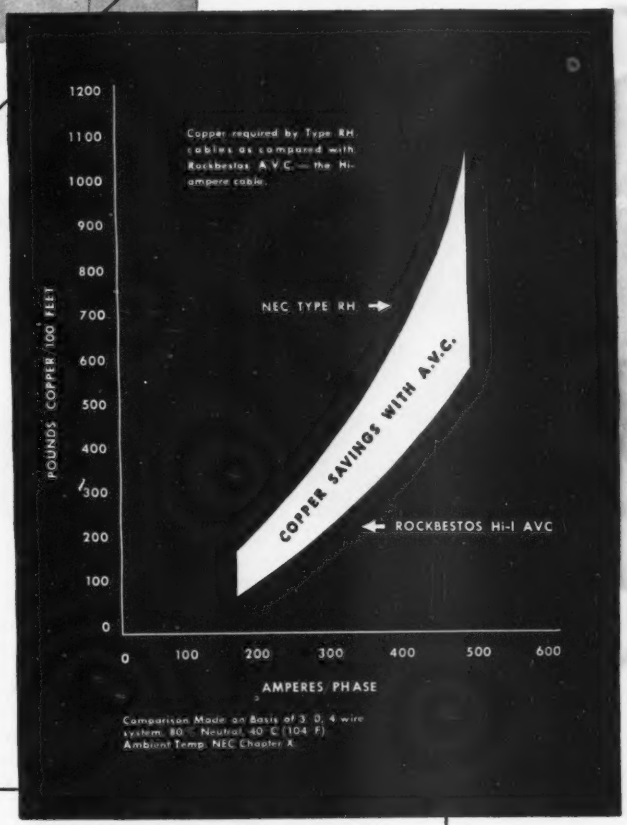
HERE'S PROOF

1 lb. of copper will do the work of 1.6 lbs. when you use

ROCKBESTOS A.V.C.®
(CODE TYPE AVA)

Hi $I = \frac{E}{R}$

Your best buy



Size for size Rockbestos A.V.C. carries more current than ordinary cables. And that's why it makes your critical copper and steel go farther.

You always use a smaller cable with Rockbestos A.V.C. Smaller cable requires *less* copper and smaller conduits and fittings on your power circuits. You save copper — save steel — save time and money.

Where voltage drop and power losses are critical, proper engineering allowances should be made.

Call your Rockbestos Application Engineer *today*. Ask for a copy of "Rx for a Building with Hardening of the Arteries."

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NEW HAVEN 4, CONNECTICUT

NEW YORK · CLEVELAND · DETROIT · CHICAGO · PITTSBURGH
ST. LOUIS · LOS ANGELES · OAKLAND, CALIF · NEW ORLEANS

NEWS ABOUT PEOPLE

Scholl, Schweers, Roberts, and Yost Are Elected VPs by Allis-Chalmers

W. G. SCHOLL

C. W. SCHWEERS

J. F. ROBERTS

W. A. YOST

Allis-Chalmers Manufacturing Co has elected four new vice presidents and a treasurer.

The new vice presidents are W. G. Scholl, general sales manager of the tractor division; C. W. Schweers, director of sales in the general machinery division; J. F. Roberts, director of engineering in the general machinery division; and W. A. Yost, manager of the mechanical power department.

G. F. Langenohl, assistant treasurer, has been made treasurer and assistant secretary. Succeeding Langenohl as assistant treasurer is N. D. Johnson, who will continue to serve as assistant secretary. The company also named two new assistant comptrollers. They are E. J. Dietrich, assistant to the comptroller, and T. D. Lyons, works comptroller.

Scholl will have charge of sales for the tractor division. He joined Allis-Chalmers in 1936 as a blockman in the Columbus branch house and has served as manager of the Toledo branch and as eastern territory manager for the tractor division.

With the company since 1930, Schweers started in the New Orleans district office as a sales representative. He later became manager of the general machinery district sales offices in Houston and Los Angeles and then manager of the New England region. Earlier this year Schweers was named director of sales in the general machinery division and as vice president will continue to have charge of sales for that division.

Roberts, who will have charge of engineering for the general machinery division, started with the company in 1919 and served as office manager in the hydraulic department. In 1927 he left to become head hydraulic engineer of the Power Corp of Canada.

Associated with TVA

From 1936 to 1942 Roberts was associated with the Tennessee Valley Authority as chief hydraulic engineer. Returning to Allis-Chalmers in 1942, he became manager of the hydraulic department and was appointed director of engineering of the general machinery division this year.

Yost was associated with the Elliott Co before joining Allis-Chalmers in 1943 as manager of the steam turbine department's marine division. Two years later he was made assistant manager of the department and then manager. Appointed manager of the mechanical power department this year, Yost will serve in the general machinery division.

Started as Clerk

Langenohl worked for several years in the shops as a production clerk before joining the treasurer's division in 1922. Four years later he was transferred to the tractor division and worked in various capacities before returning to the treasurer's division. In 1941 he became assistant to the treasurer and in 1942 assistant treasurer.

Starting at Allis-Chalmers as collection clerk in the treasurer's division in 1937, Johnson advanced to assistant treasurer in 1942. Dietrich joined the company's accounting department in 1916 and later served as works accountant at the Springfield, Ill, Works and the West Allis Works. He became general works accountant in 1937 and assistant to the comptroller

STEEL in STOCK

for Suppliers of Power and Light

Convenient to electric power and light companies from coast to coast, thirteen Ryerson steel-service plants stand ready to supply these utilities and their equipment manufacturers.

True, shortages resulting from the twin pressures of defense requirements and unprecedented civilian demand may make it impossible for us to furnish every item on every order, much as we would like to. But it is likely that many of your requirements are among the carbon, alloy and stainless steels we have on hand for prompt shipment. And experienced Ryerson steel men are always glad to work with you—help you make the most of available steel.

From switchboard to shipping floor all of us are ready to give you prompt service whenever humanly possible. So call us for every steel need.

PRINCIPAL PRODUCTS

BARS—Carbon and alloy, hot rolled and cold finished, reinforcing bars, etc.
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate, Inland Hi-Steel, etc.
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes, structural tubing, etc.
STAINLESS—Allegheny sheets, plates, bars, tubes, pipe, pipe fittings, etc.
BABBITT METAL—Ryerson Glyco in 5 grades
MACHINERY & TOOLS—for metal fabrication

RYERSON STEEL

RYERSON CERTIFIED STEELS

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI
CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

Engrave

PANELS UP TO 25" WIDE IN YOUR OWN SHOP WITH THE NEW ENGRAVOGRAPH

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- The *only* portable machine which reproduces *15* sizes from one master alphabet.
- The *only* one with *adjustable* copy holding slides for multiline engraving in one set-up.
- Self-centering holding vise for nameplates and dials.

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I-S 48 —portable model

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NEW HERMES, Inc.

13-19 University Place, N. Y. 3, N. Y.

CANADA 359 St. James St., Montreal

World's Largest Manufacturer of Portable Engraving Machines

in 1945. Lyons started with the company in 1937 and has been working in the comptroller's division since 1942.

•

Buckland Is Elected VP of Minneapolis-Honeywell

Charles C. Buckland, secretary of Minneapolis-Honeywell Regulator Co since 1932, has been elected a vice president of the firm. He will continue as secretary.

C. C. BUCKLAND

Buckland joined Honeywell in 1931 after serving as general manager of the Berkshire Street Railway. He began his business career with the New York, New Haven & Hartford Railroad Co.

In his new position Buckland will head a sub-contracting division developed to correlate and expand subcontracting activities of M-H's aeronautical and ordnance divisions.

•

Paul Debolt has been elected president of Ohio Rural Electric Cooperative. Other new officers are **T. S. Edwards** and **Martin C. Petrie,** vice presidents; and **A. E. Halterman,** secretary-treasurer.

Alvien Henn, senior power dispatcher, and **John R. King,** associate electrical engineer and staff assistant to the superintendent, have retired from their positions with Seattle City Light. Henn joined the utility in 1926 as an operator at the Gorge power house and King in 1934 as an order clerk.

Robert P. Burrows, assistant manager of advertising of General Electric Co's Lamp Division, with headquarters at Nela Park, Cleveland, has retired. With the company for 36 years, Burrows has been assistant manager of advertising since 1934 and previously was manager of the Lamp Division's Pacific Sales District for five years. He joined the company's research and commercial engineering section at Nela Park in 1911.

Thaddeus L. Sharkey, former assistant rate engineer for Potomac Electric Power Co, has joined the staff of Ebasco Services, Inc, as a rate consultant. He began his utility career with Washington Railway & Electric Co in 1931, parent company of Potomac Electric at that time.

A. P. Wendland has been appointed manager of the General Services Department of the Elliot Co, with headquarters at Jeannette, Pa. Manager of mechanical sales of the Philadelphia office for the past year, Wendland earlier served as assistant to the director of research and development and established the Wilmington, Del., office. He joined the company in 1925.

George C. Mercer, purchasing agent for P. R. Mallory & Co, has been promoted to director of purchasing. Succeeding him as purchasing agent is **W. J. Topmiller, Jr,** formerly assistant purchasing agent.

L. W. Bates, manager of the Bluefield (W. Va.) district of Appalachian Electric Power Co, has been appointed assistant manager of the Bluefield division, which comprises four districts. In another appointment the utility named **Jenkins Scott,** electrical engineer in the Bluefield district, power sales engineer in the Welch district. Bates joined the former Appalachian Power Co in 1917 in the meter department at Bluefield. In 1934 he became a power sales engineer in the commercial department and was named district manager in 1943. Scott started with the utility in 1949.

Gage R. Cooper has been named acting district manager at Ann Arbor for Detroit Edison Co. He is taking over the duties of **Robert R. Brown,** who has retired as Ann Arbor district manager after more than 40 years' service with Detroit Edison. Cooper has been staff assistant in the utility's Detroit sales department. Brown joined Detroit Edison in 1911 as a legal clerk and later transferred to the sales de-

partment. He was appointed Grand River District agent in 1919 and in 1926 became manager of the St. Clair District. Brown was named to the Ann Arbor post in 1937.

C. E. Duke, electrical superintendent of Georgia Power Co's Plant Mitchell for the past two years, has been made superintendent of Plant McManus.

George I. Cohn, assistant professor of electrical engineering at Illinois Institute of Technology, has been appointed associate professor. He has been teaching at IIT since 1947.

Gus B. Riedel has retired as superintendent of transmission and distribution for Scranton (Pa.) Electric Co after more than 41 years of service with the utility.

OBITUARY

W. G. James, 61, manager of large power transformer engineering for the Transformer Division of Westinghouse Electric Corp at Sharon, Pa., died recently. Starting as a power transformer design engineer for Westinghouse in 1920, James later was appointed section manager in charge of the design of all large power transformers of the shell form of construction. He became manager of large power transformer engineering in 1940. Before joining Westinghouse. James taught electrical engineering at the University of Maine and Texas A. & M.

Paul F. Williams, 76, founder of the G & W Electric Specialty Co, Chicago, died at Chicago Sept. 10. He founded the company in 1905 and served as its president until 1950 when he became chairman of the board. Williams was with Commonwealth Edison Co as distribution engineer until 1935.

Dr W. A. Carrothers, 62, chairman of the British Columbia Public Utilities Commission for 12 years died recently at Victoria. Prior to his appointment to the PUC Carrothers taught economics at the University of Saskatchewan and the University of British Columbia and served on the B. C. Economic Council, Board of Industrial Relations, and the Coal and Petroleum Board.

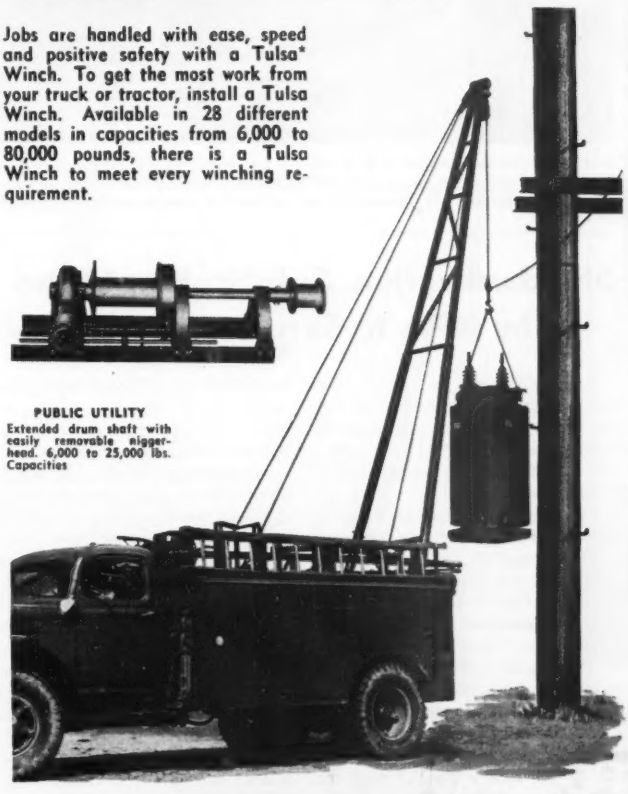
PULL *and* POWER

Tulsa Winch models for all trucks from ½-ton up.

Tulsa Winches for all crawler tractors complete with transmission, line roller assembly and mounting brackets ready for installation.

Jobs are handled with ease, speed and positive safety with a Tulsa* Winch. To get the most work from your truck or tractor, install a Tulsa Winch. Available in 28 different models in capacities from 6,000 to 80,000 pounds, there is a Tulsa Winch to meet every winching requirement.

PUBLIC UTILITY
Extended drum shaft with easily removable nigger-head. 6,000 to 25,000 lbs. Capacities



*Reg. U. S. Pat. Off.

Tulsa Winch
TULSA, OKLAHOMA
DIVISION OF VICKERS INC.

815-49 E. First Street

MANUFACTURERS and MARKETS

SWITCH DISPLAY WAGON of A. B. Chance Co has two switch units mounted on a double cross arm which pivots so it can be distorted to show how the Chance Compensator Control operates. Wagon will tour central and western states during the fall

Standardization, Substitution Urged by NPA to Save Scarce Materials

Standardization, the spook that haunted consumer goods makers during World War II, is back again in orders now being drafted by Washington. But the ghost is just a shade of its war-time self.

This time, it is just a minor part of the metal conservation program being pushed through by the government.

A major objective of the Controlled Materials Plan is to save metal, of course. Otherwise, the approach to conservation largely has been limited to such broad steps as bans on nonessential construction and on use of scarce materials for decorative trim.

But the shortage of copper, brought to the critical point by the recent strike, put new impetus behind the planning of a full-blown conservation program. Defense Production Administrator Manly Fleischmann gave the signal last week: Besides stopping unessential uses of scarce metal, there will be savings at the fabricating and processing stages through substitution, standardization, and simplification.

What moved Fleischmann was the prospect of an unforeseen squeeze on consumer goods production. DPA had made up allotments of steel, copper, and aluminum for the fourth quarter before the copper strike. The allotments provided enough steel for about 60% of pre-Korea production of passenger cars, 58% of household appliances, and other consumer hard goods. The copper allotments didn't match, but DPA figured manufacturers would find substitutes and cut corners enough to make up the deficiency in their copper quotas.

The strike played hob with that theory. No one is sure yet just how much copper it cost, and how much of the loss can be made up by juggling fabricators' production schedules. One thing is certain, though: Copper supply will be less than DPA estimated for the fourth quarter. And consumer goods makers will take the rap for most of the deficit. They simply won't get all the copper their allotments entitles them to.

Stress Copper Conservation

To start, the accent is on conservation of copper. National Production Authority is dusting off the "death sentence" provisions of its old M-12 order. As it was originally drafted last December, the "death sentence" would have banned use of copper in 250 finished products—from bird cages and jewelry to window screens and other builders' hardware. It was slated to go into effect last March 1. But manufacturers who claimed the order would put them out of business complained so effectively that NPA abandoned the "death sentence" without a trial.

The revived order won't be nearly so drastic. Small users, like makers of jewelry, probably will get exemptions on the basis that the savings would be trifling. Another factor probably will be the practicability of substitution.

But conservation is being planned across the board. For example, this week's order limiting installations of automatic transmissions in passenger cars is aimed at saving alloy steel and aluminum. Other orders are being drafted to conserve nickel, zinc, sulphuric acid, and so on.

Act with Caution

But the DPA-NPA staffers are treading cautiously in their selection of conservation mechanisms. They won't order any manufacturer to substitute a new material for a more scarce one—except as a last resort or unless industry men ask for such an order. There's been much substitution of material already by industry on a voluntary basis. The controllers are thinking of formalizing some substitution in consumer goods production. Some manufacturers have requested such orders to protect themselves from

G-E "LIGHT CONDITIONING" RECIPE

See what a lighted valance can do for your living room

STRETCH a lighted valance across your living room wall-to-wall and you'll be surprised at how the room seems to grow in size. How it glows with new beauty. How colors stand out in draperies and furnishings, as ceiling and walls are bathed with soft, cool, uniform light from concealed fluorescent lamps.

It's one of the newest ideas in home decoration! Confined at first to the most expensive interiors, lighted valances are now being offered at popular prices to fit any home.

In the interior above, the lighted valance is combined with portable lamps in a typical G-E Light Conditioning recipe:

WHAT TO USE: 20, 25 or 40-watt G-E fluorescent tubes end-to-end to fit valance length.

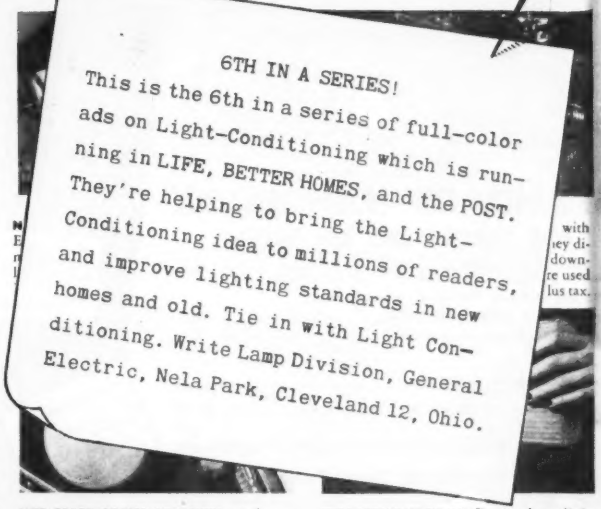
HOW TO USE: Wall-to-wall as above, or over doors or windows. Valance can be up to 10" deep.

For best results, be *sure* your lamps are marked "G-E".

FREE "LIGHT CONDITIONING" RECIPE BOOKLET. Brand new! Contains 22 Light Conditioning recipes. Covers every room in the house. Specifies bulbs, fixtures, measurements. Write Lamp Division, General Electric Company, Dept. 166-EW-9, Nela Park, Cleveland 12, Ohio.

6TH IN A SERIES!

This is the 6th in a series of full-color ads on Light-Conditioning which is running in LIFE, BETTER HOMES, and the POST. They're helping to bring the Light-Conditioning idea to millions of readers, and improve lighting standards in new homes and old. Tie in with Light Conditioning. Write Lamp Division, General Electric, Nela Park, Cleveland 12, Ohio.



LESS GLARE, SOFTER SHADOWS, are the result of using General Electric's new 100-watt White lamp. Revolutionary new inside "Q" coating, product of G-E research, makes the difference. 100-watt White lamp **21¢** plus tax.

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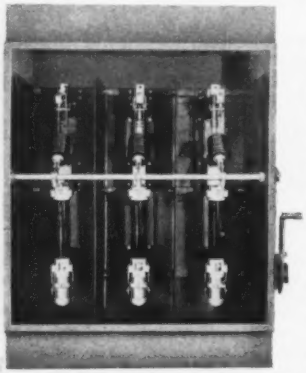
Since more factory power is being supplied at high voltage to convenient load centers, high voltage switches take on added importance.



Three E Air Interrupter type will give you the utmost. They can be opened under loads to 600 amperes at 15000 volts. Magnetizing currents of transformers and charging currents of lines and cables are also successfully interrupted.

Interruptions are performed without external arcing and without use of oil or other inflammable liquids.

Used with power fuses, as illustrated, they provide complete circuit protection at exceptionally low cost.

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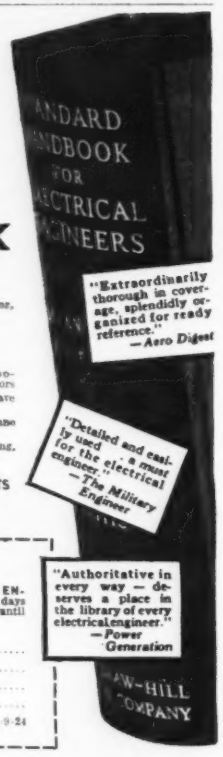
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competitors who refuse to substitute.

The same thing may happen where manufacturers in any one field generally cut back lines, turning out only two or three instead of eight or ten models. But NPA wants no part of setting specifications.

Officials would like to see more substitution of aluminum for copper in electrical apparatus. But they are not planning to argue with the engineers who insist that widespread substitution isn't practicable. So any developments of this nature will be the result of voluntary substitution by electrical manufacturers.

Appliance makers have their own plans, NPA hears, for limiting their assortment of 1952 models. One manufacturer already has cut down his electric stove models from eight to three and most refrigerator makers are substituting plastic for metal ice trays. Several manufacturers have stopped making electric ranges with double ovens.

One NPA official says these changes may be ordered by the government if enough of the industry wants to adopt them. It wouldn't be fair, he contends, to penalize the manufacturer who tries to save scarce materials in favor of a competitor who won't.

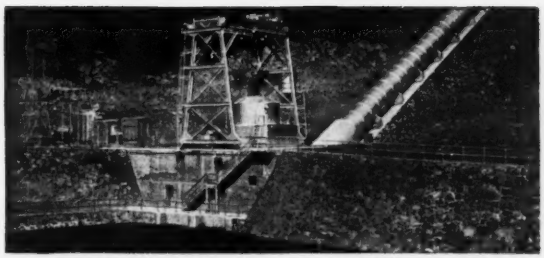
MANUFACTURING BRIEFS

United Electrical Workers, independent, has retained the right to bargain for 19,000 production workers at General Electric Co's main plant and research laboratory at Schenectady, N. Y. The union defeated the International Union of Electrical Workers, CIO, 11,542 to 4,851 in a National Labor Relations Board election recently.

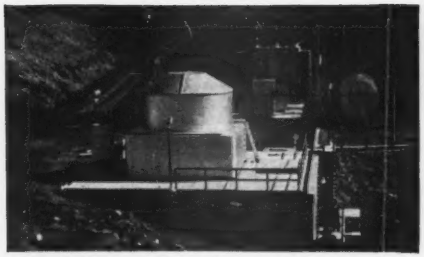
Total primary aluminum production for July was 145,395,271 lb, the Aluminum Association has reported. July output topped June's production of 134,906,971 lb by about 10.5 million lb.

Metal Prices
Sept. 17, 1951

COPPER, Conn., V., lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits, qual. N. Y., lb	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap No. 1 heavy, Pitts., ton	45.00

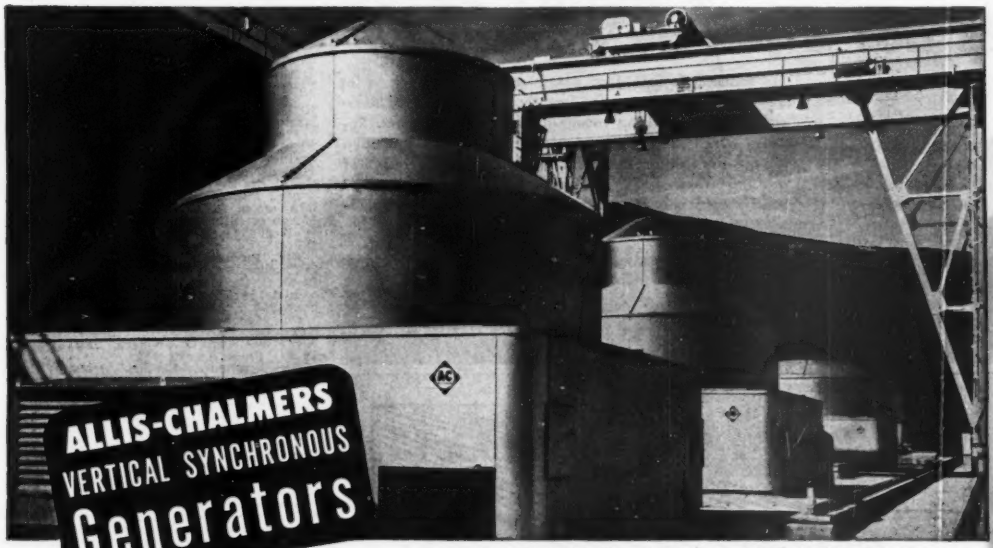


UPPER MALAD: One 8400 kva, 85.7% pf, 6900 volt, 225 rpm generator. Also, A-C 12,000 hp, 124 ft head Francis-type turbine, station-service substation, switchgear, main power transformer.



LOWER MALAD: One 15,500 kva, 87% pf, 6900 volt, 200 rpm generator. Also, A-C 22,000 hp, 157 ft head Francis-type turbine.

All generators are modified umbrella type (with upper guide bearings) furnished complete with outdoor housings.



LOWER SALMON: Four 17,500 kva, 86% pf, 13,800 volt, 120 rpm generators — two arranged for variable-pitch propellers. Also, A-C 12,000 kva power transformer.

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Placed in operation in 1948 and 1949, these generators supply southern Idaho as part of the Northwest power pool. The Malad stations, which are remote-controlled from the Lower Salmon station, operate 24 hours a day, seven days a week. Lower Salmon is used for load factoring (peak load operation) and runs at full load an average of about 10 hours a day every day of the year.

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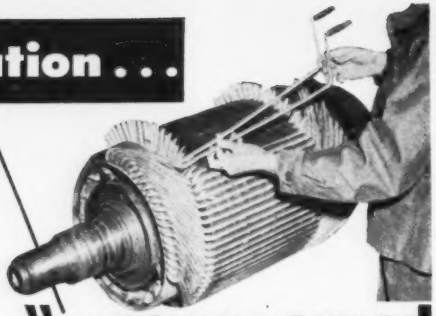

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No indeed. In fact, that penny saved may mean a lot of dollars lost later on—lost through expensive, time-consuming repairs on rotating electrical equipment. Repairs which shut down an electric motor badly needed on the production line. And it can all be the result of one tiny weak spot in the insulation. How to prevent it? Specify uniformly top-quality National insulation. It's always premium quality and it's competitively priced.

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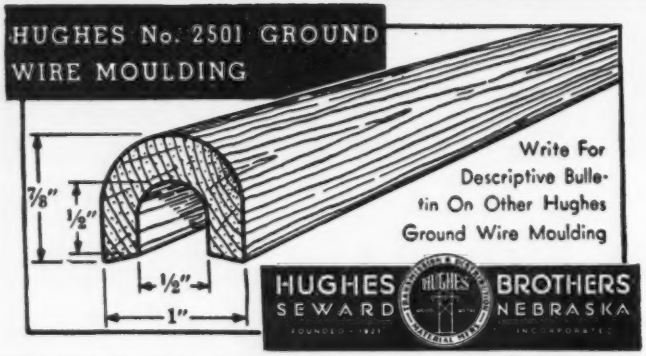

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

California—Southern California Edison Co., 601 W. 5 St., Los Angeles, Calif., constructing Vermillion Valley Dam across Mono Creek, Fresno Co. $8,500,000.

Calif., Los Angeles—Southern California Edison Co., 601 W. 5 St., Los Angeles, interconnection of electrical distr. systems $2,000,000.

Calif., Los Angeles—Los Angeles Dpt. Water & Power, 207 S. Broadway, fabrication, erection structural steel for Units 1 and 2 Valley Steam Plant, $650,000. Plans deposit $25. S. B. Morris, ch. engr.

Calif., Rocky Hill — Radio Station KCOK, Mooney Road, Tulare, television station in vicinity of here. $250,000.

Fla., Jacksonville—City, Utilities Bldg., 69 kv transmission line from Green Cool Springs line to Naval Air Station, approx. 4½ mi. and install new sub-tation at Naval Air Station. $350,000.

Fla., Panama City—Sixth Naval Dist., Charleston, S. C., Navy Mine Counter-Measures Station, 300 kva sub-station, NOY 29399, Spec. 31091. Plans deposit $10.

Fla., Panama City—Dpt. Navy, Officer in Charge of Construction, Box 365, Naval Base, S. C., installing 3 government furnished 100 KVA transformers. Plans deposit $10.

Ga., Macon—U. S. Eng., P. O. Box 889, Savannah, constr. Sub-Station 2, Robins Air Force Base, near here, Eng 09-133-52-19. Plans deposit $10.

Kan., Wichita—Boeing Airplane Co., Wichita Div., Boeing Airplane Co. Plant 2, Personnel Bldg. 3 story, 58x324 ft. masonry electronics bldg., Air Force Plant 13. Plans deposit $25, Wilson & Co., 223 N. Santa Fe St., Salina, engrs.

New Mexico-Texas—Bureau Reclamation, Dpt. Interior, El Paso, Tex., Dona Ana, Las Cruces and Central sub-stations addns., Rio Grande Proj., Spec. No. DC-3532.

Oregon—Bonneville Power Admin., 827 N.E. Oregon St., Portland, construct Big Eddy Switching Station, Inv. 6049. Plans deposit $25.

Pa., West Mifflin—Westinghouse Electric Corp. (Atomic Power Div.) West Mifflin, 40,000 sq. ft., brick, tile, steel plant addn. $500,000. Hunting, Larsen & Dunnells, 130 7th Ave., Pittsburgh, engrs.

Tex., Galveston—Mirador Television-Radio Station, c/o U. S. National Bank Bldg., television station, $250,000.

Alaska—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, installing two 16,667 kva. generators for Eklutna Power Plant, Spec. DC-3536, Eklutna Proj.

Alta., Edmonton—F. T. Collins, Dpt. Transport, Ottawa, Ont., power house at Dpt. Transport site, for Govt. of Canada, Ottawa, Ont. Plans deposit $10.

Low Bidders & Contracts Awarded

Colo., Boulder—Collier Electric Co., 700 W. 13 Ave., Denver, Colo. CA Est. $800,000-$1,000,000, electrical constr. work at Rock Flats plant, McCarty, Johnson, Davis & Bell, 944 Osage, Denver, Colo., CA, est. $2,000,000, mechanical constr. work at Rocky Flat plant. Atomic Energy Comm., Contract Bd., Los Alamos, N. M. The Austin Co., 1300 Glenarm Pl., Denver, Colo., engrs.

Conn., Plainville—Gellatly Constr. Co., 181 Sylvan Ave., Bridgeport, Conn., LB $750,000, factory, Trumbull Electric Mfg. Co., Plainville, Conn. Bids July 30.

Montana—Pacific Electric Mfg. Corp., 5815 3 St., San Francisco, Calif. CA $38,010, transmission div., one 115,000 volt circuit breaker, three 115,000 volt horn gap switches for temporary Garrison sub-station, Missouri River Basin Proj. Spec. 6008-72, Bureau Reclamation, Dpt. Interior, Billings, Mont. Bids Aug. 14,

awarded Aug. 22.

Mich., South Haven—Getman Brothers Co., South Haven, Mich. CA $1,400,000. 1 story, 45x95 ft., brick, steel, concrete municipal power plant addn., incl. steam turbine, generator, soil and track hopper, Lake Michigan, City, Max Norris, supt. Pub. Wks., South Haven, Mich. Hamilton Weeber & Ward, 356 Houseman Bldg., Grand Rapids, engrs.

Nebr., Omaha—Peter Kiewit Sons Co., Omaha Natl. Bank Bldg., Omaha, Neb. C.A. $800,000. cold storage plant. United States Cold Storage Corp., 2011 W. Pershing Rd., Chicago, Ill. Bids Aug. 22.

South Dakota—General Electric Co., 103 N. Wyoming St., Butte, Mont. CA. $63,449, Schedules 1, 2 and 3, one 4,000 kva one 1,500-kva and one 25-kva transformers; 6 lightning arresters; one 200-kva step-voltage regulator, for Philip substation, Missouri River Basin Proj. Spec. 600S-70. Bureau Reclamation, Dpt. Interior, Billings, Mont. Bids July 27, awarded Aug. 23.

Tex., Gonzales—Southwestern Associated Telephone Co., Gonzales, Tex. Force account. $100,000. replacing unit of telephone pole and cable lines, inside city limits. Southwestern Associated Telephone Co., Gonzales, Tex.

Va., Langley Air Force Base—Patterson, Emerson & Comstock Co., of Alabama Inc., P. O. Box 387, Hampton, Va., L.B. $232,950. Stratton Rd. sub-station and electric facilities. National Advisory Committee for Aeronautics, Langley Air Force Base, Va. Bids Aug. 30.

Washington—Bay Constr. Co., Airport Way and Holgate St., Seattle, Wash., LB, $559,445, Schedule 1, $458,070, Schedule 2, Grand Coulee Spokane 230-kv transmission line. Bonneville Power Admin., 827 N.E. Oregon St., Portland, Ore. Bids Sept. 7.

Wis., Milwaukee—Selzer-Ornst Co., 6222 W. State St., Milwaukee, Wis. CA $1,000,000. 3 story, 100,000 sq. ft. electric switches factory addn. Cutler-Hammer, Inc., 315 N. 2 St., Milwaukee 3, Wis. Awarded Aug. 28.

Quebec—Simard et Frere Co. Ltd., Third Ave. E., Amos, Que., CA. Approx. $11,000,000-$15,000,000. dam and power house at Power Development at Rapids 2, Upper Ottawa River south of Cadilla. Quebec Hydroelectric Power Comn., Quebec City, Que.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Chicago—Allied Chemical & Dye Corp., Barrett Div., 40 Rector St., New York, N. Y., chemicals mfg. works, $30,000,000.

Ill., Chicago—Republic Steel Corp., Republic Bldg., Cleveland, O., 1 story, steel pipe mill, $22,000,000.

Nev., Henderson — Western Electro Chemical Co., Henderson, industrial plant. $10,000,000.

N. J., Trenton—Louis H. Cahan & Co., Inc., Market St., National Bank Bldg., Phila., Pa., 30 story office, 138-140 W. State St., opposite New Jersey State Capitol. $6,000,000.

Pa., Phila.—Pennsylvania R. R., J. L. Gressitt, ch. engr., Broad St. Station Bldg., 1617 Pennsylvania Blvd., Phila., Broad St. Station imprvs. $19,500,000.

Low Bidders & Contracts Awarded

Ark., Little Rock—W. R. Grimshaw Co., Kome Bldg., Tulsa, Okla. CA $4,504,062, general constr. 9 story, bsmnt., hospital. University Medical School, Little Rock, Ark.2. Bids Sept. 6.

Minn., Minneapolis—Madsen Constr. Co., 2110 Nicollet Ave., Minneapolis, Minn. and Steenberg Constr. Co., 1371 Marshall Ave., St. Paul, Minn. CA $5,630,642. General constr. completion 14 story, Mayo Memorial Medical Center. Regents of University of Minnesota, R. S. Callaway, purch. agt., 323 Admin. Bldg., Main Campus, Minneapolis, Minn.

N. J., Flemington—Nason & Cullen, 6522 Vine St., Phila., Pa., LB $2,000,000, hospital and medical center. Hunterdon Medical Center, Flemington, N. J. Bids Aug. 28.

Wis., Appleton — Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., Day Labor, one 25x40 ft. pumphouse, 40x60 ft. evaporator bldg., 27x60 ft. bleacher plant; settling tank, 93 ft. x 38 ft., concrete steel, brick.

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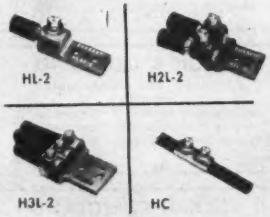

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1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
1—	1000	Whse.	900	600	4150
1—	1000	G.E.	900	260	4100/6900
1—	750	Whse.	900	275	2300/4150
2—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	G.E.	900	600	2300/4000
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
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3—	1250	G.E.	HVDDJ	1	6800x550
4—	333	G.E.	HKDD	1	13800/6900x230/460
6—	300	G.E.	HT	3	2400x240/480

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3	1000	West.	66000—7200
3	500	G.E.	66000—2400
4	2500	West.	44000—11000
3	1500	Wag.	44000—6900 NEW
3	200	Mol.	44000/22000—440/220
3	75	Mol.	44000—2300/4600
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6	150	G.E.	24500—4600/2300
2	7500	West.	33000—13200, 3 ph.
3	200	West.	33000—7200/12470 Y
4	150	G.E.	33000—7200/12470
3	75	Mol.	33000—2300
3	75	Wag.	33000—7200/12470 Y
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3	500	A. C.	11000—2300
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3	150	Mol.	7620/13200 Y—120/240
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3	75	West.	6600—460/230

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400	*Al-Ch	ARWW	900
300	*Westgh	CS	3600
300	G.E.	FT-559	1800
300	Al-Ch	AR	900
250	L-Allis	1405	720
250	Westgh	CS	600
150	G.E.	IE	1800
150	*Al-Ch	AW	1800
125	Westg (new)	CS584	3600
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100	*G.E.	FT542Z	1800
100	U.S. (Vert)	CFU	1200
100	Westg	CS	1200
100	G.E. (new)	K6333	720
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22	G.E.	ITC5809	1200
20	Westgh.	C1	900
15	G.E.	ITC5810-25 cy.	720
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6½	R & M	425A (TENV)	1200
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700	G.E.	TS		514
328	*A.C.	Dr Pf	1.0	720
300	Cr-Wh.	ENG	1.0	300
250	*A.C.	Dr Pf	.8	720
220	G.E.	ATI	1.0	900
196	El. Machy.	Ped	1.0	450
150	El. Machy.	EM	.8	720
150	*Westgh.		1.0	300
125	*El. Machy.	SYN	1.0	900
125	Cr-Wh.	103S	1.0	900
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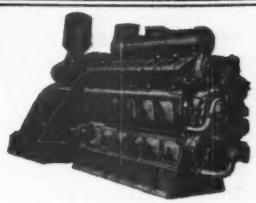

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1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand		225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

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LETTERS TO THE EDITOR

$325 Million REA Backlog

To the Editor:

Reference in the "Washington Comment" column of Electrical World, Aug. 13, to the $325,107,000 backlog of loan applications in Rural Electrification Administration headquarters raises some interesting questions relative to its size.

In almost every state that has a fairly comprehensive network of REA-financed distribution systems, the REA state association is campaigning to substitute a grandiose transmission system and one or more generating plants for their present source of supply. Some of these plans blossom into approved projects, but with the funds having a "stop order" on them so that recipients of the loan cannot touch it. Other plans are laid away on the "shelf" because they are too hot to handle at the moment.

There are millions of dollars tied up in "stop ordered" loans already. Evidence of this lies in the 605 million dollars in unadvanced funds on approved loans at the end of 1950. Now that the legitimate rural distribution program needs a shot in the arm, couldn't a number of these shelf-worn plans be a part of the backlog of unapproved applications?

REA has a "feasibility" policy, whereby a study is made to prove—on paper—that with an additional loan invested in more lines, an operating cooperative will add sufficient revenue to make the total adequate to meet the operating expenses and loan repayment schedules of the expanded project. The REA act says that loans "shall not be made unless the Administrator finds and certifies that in his judgment the security of the loan is reasonably adequate, and such loan will be repaid within the time agreed." In spite of surveys which have indicated that heavy construction will be ultimately feasible, many early lines were built without regard to ultimate load of that area or to the area beyond, which eventually would be served. Even though this method was replaced by one which demanded a "system study" of ultimate needs, and that each addition conform to that study, this plan frequently runs afoul of the "feasibility" policy.

So even now, lines are built to get a modicum of service, with full knowledge that such lines will have to be heavied up very soon. In the long run, retirement costs and losses will eat up the temporary saving in investment charges, but isn't this another way to drag out the need for more money?

So, unless you can obtain and publish a breakdown of the types of facilities that are under consideration in the $325 million backlog on file, such a backlog need not necessarily be considered as an indication that REA has that much more valid construction ahead.

Frank A. Dawes
Management Consultant
Springfield, Missouri

Editor's Note: Electrical World would be glad to publish a breakdown of the facilities covered by the backlog of loan applications on file with the Rural Electrification Administration.

The Author Answers

To the Editor:

The article entitled, "Don't Utilities Really Want Electrical Engineers?" Electrical World, July 30, was based on one portion of an extensive survey of graduates of electrical engineering. Since the entire survey was not presented, some readers have questioned the accuracy of the curves as applied to the earlier years out of college.

The curves are based on the average of all classes over a 33-year period. Thus, salary for the first year out of college covers those in the class of 1915 ($600 for first year) averaged along with those graduating in 1948 ($3500 for first year). The depression of the early thirties and the inflation of the late forties have produced a rubber dollar which is hard to apply in analysis over a period of 33 years.

However, the curves give a correct picture of the salary trends over the years. An exact picture of the average salary by year of graduation was given in the complete survey. Income values shown on these curves show the effect of economic cycles and check very closely with other recent surveys.

The survey upon which the article is based covers only Kansas State graduates in Electrical Engineering. Questionnaires upon which data were based were obtained between July, 1949 and July, 1950. Our electrical engineering graduates whose questionnaires were returned are distributed geographically approximately as follows: 2% in New England (Maine, N. H., Vt., Mass., Conn., R. I.); 18% in North Atlantic (N. Y., P., N. J., Md., Dela., and Washington, D. C.); 4% in South (Va., W. Va., N. C., S. C., Ky., Tenn., La., Miss., Ala., Ga., Fla.,); 56% between Appalachians and Rocky Mts. (Mich., Wisc., Ohio, Ind., Ill., Minn., Iowa, Mo., N. D., S. D., Nebr., Kansas, Colo.); 10% in Southwest (Texas, N. Mex., Okla., Ark.); 9% between Rocky Mts. and Pacific Coast (Calif., Ore., Wash., Mont., Ida., Nev., Utah, Wyo., Ariz.) and 1% overseas.

Classification of graduates for this study was based upon their current employment at the time the questionnaire was returned. Some men have held several positions and have shifted classification but data are based on the current status of 1949-50.

The number of our electrical engineering graduates engaged in teaching is small relative to other classifications (107 with electric utilities). Hence the salary trend for teaching may not check the national average. However, the trend of income for teaching compared with electric utilities does coincide with the private information of the author.

Interested readers in the electric utility field are urged to write for a reprint of the complete survey (enclose 6 cents for postage).

The author has been the recipient of a large number of letters regarding the article. Only one letter of criticism has been received.

R. G. Kloeffler
Electrical Engineering Dept
Kansas State College
Manhattan, Kansas

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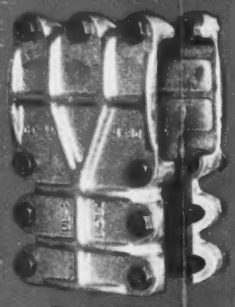

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Publication 4107
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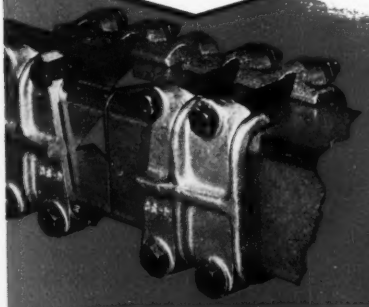
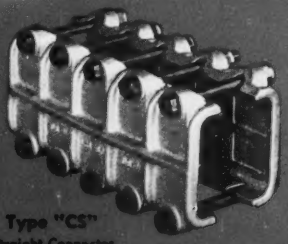
Cut-away view showing two point-by-point contact lines at each corner of square tubing





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Type "CTB"
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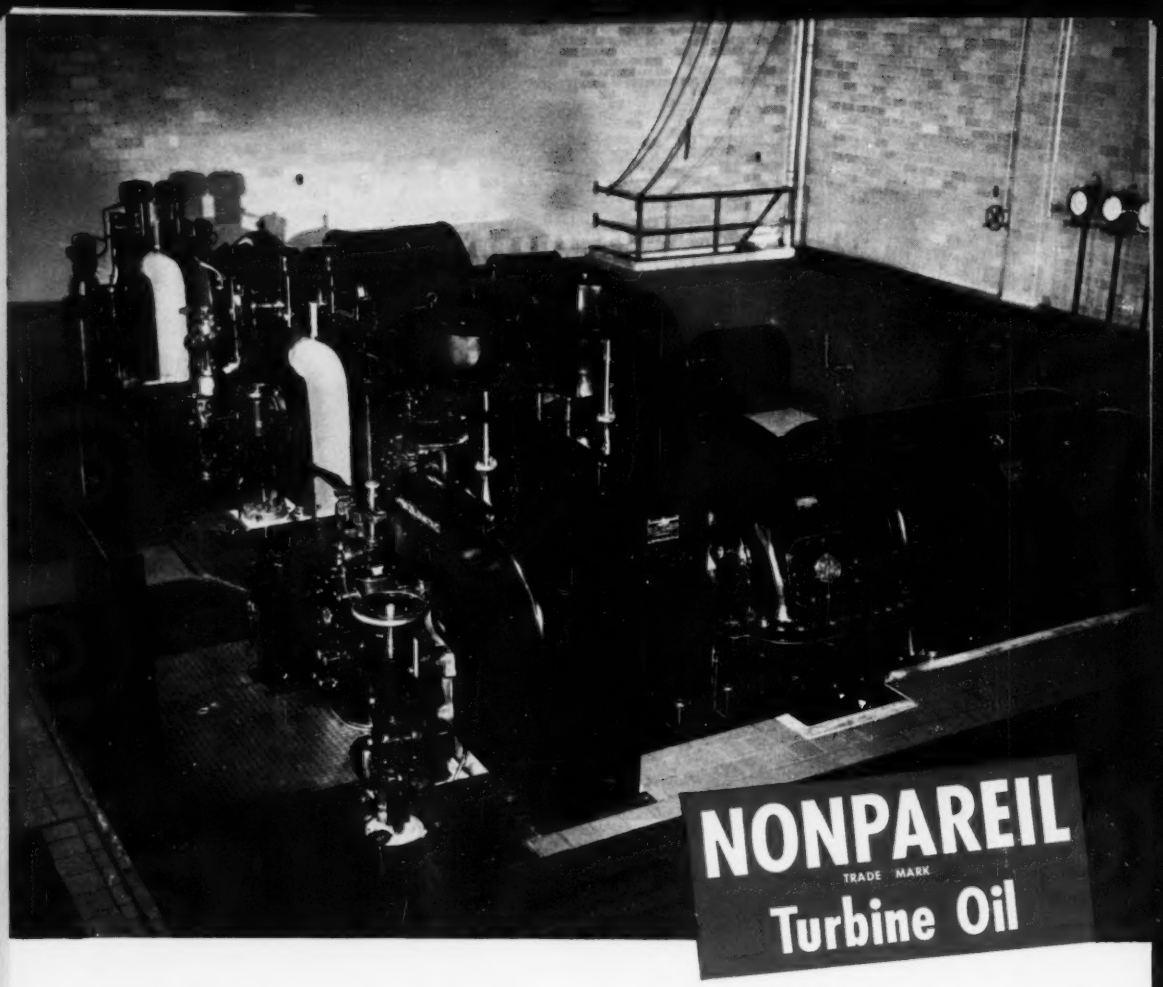

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